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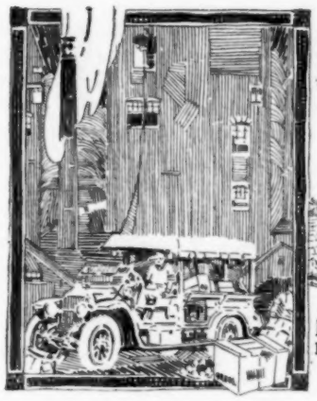
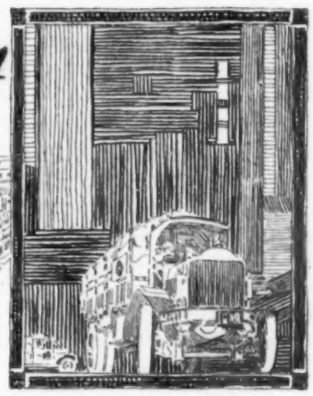


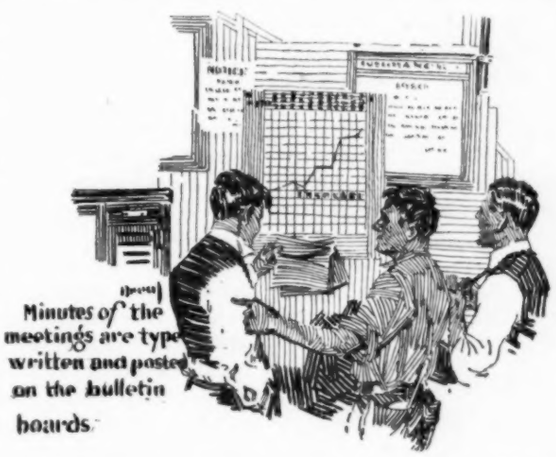
Increasing Production Without a Bonus

BY
FRED H. COLVIN
EDITOR AMERICAN MACHINIST



Successful management does not depend primarily upon any set rule, plan, or method, but on the spirit which lies behind it. There is no royal road which will produce the desired result without sympathy and understanding on the part of the management. Here is a plant in which success has been attained, even in these trying times, without piecework or bonuses of any kind.

NEARLY five years ago, on June 1, 1915, to be exact, the White Motor Company, Cleveland, Ohio, formed and put into operation a plan of shop committees with the object of bringing about a closer relationship between the management and its employees, so as to increase the confidence of each in the other through an educational program which was particularly arranged to develop a better understanding of the other's problems. The shop committees are elected by secret ballot in the ratio of one representative for each ten employees, the management believing that any plan of this kind should be as representative and as democratic as possible. Each department is divided into groups of approximately ten men and a representative is elected by each group. The employees elected by the various groups in one department form the department committee.



Minutes of the meetings are typewritten and posted on the bulletin boards.

Any employee of the department in which an election is held is eligible to act as a committeeman. In order to secure complete representation new members are elected monthly to succeed others who retire after approximately one year's service, the personnel of the committee being thus automatically changed and tending to prevent the formation of cliques or political steering committees. A committeeman, however, is eligible for re-election should his constituents so desire.

Meetings are held bi-weekly but are so scheduled that each department meets separately so as to have only one committee meeting at a time. On special occasions, however, meetings are held which include the entire committeemen. All these meetings are held on company time. Committeemen are expected to attend all meetings. The superintendents over the departments represented, their assistants and the general foremen are privileged to attend the department meetings but are not considered members of the committee.

There are no printed rules or regulations pertaining to the formation or activities of the committees. All questions of interest, whether pertaining to the factory or not, are freely discussed as the committee meetings are open forums. Questions pertaining to policy, production, expansion or any of the various activities of the factory are discussed and illustrated by representatives of the management. Minutes of the meetings are typewritten and posted on the bulletin boards of the department locker rooms. Graphic charts and other illustrations which have been discussed in the committee meetings are also placed on the walls of the locker rooms for the benefit of the employees.

The very simple form of committee system here outlined has been in operation for nearly five years. It is as unhampered and free of machinery as the management has been able to make it. It is very similar in practice to a well-regulated family, in so far as it is possible to make it.

These committees are used as mediums through which can be transmitted the thoughts, feelings, requests and desires of the employees to management and vice versa. Through these committees the employees are taught to see the necessity of production and to look for the means of securing it economically. The beauty of the plan and the success which has attended it are largely due to the fact that the employees are taken fully into the confidence of the management and are given an insight into the problems which confront the managers. They have every opportunity to follow the problems up in detail and to make suggestions if they so desire. In other words, the "cards are laid on the table" and the various problems as they confront the management from time to time are discussed by a rep-

resentative of the management at the committee meetings. The charts and tables used are then permanently posted in the committee room for study and reference.

The committee is free to discuss any point which seems of interest and to make recommendations in the form of minutes to the department superintendent. If such recommendations are considered practical and do not conflict with the general policy, they are acted upon and put into practice. If these recommendations necessitate any considerable outlay or are radical departures from existing policies they are referred to the management by the department superintendent. If the management decides favorably, they become part of the general policy. If, on the other hand, the management does not see its way clear to their adoption, the manager goes before the committee, informs it of this fact and gives the reasons for his decision.

It is extremely interesting to note that at no time has the ability of the manager to judge and decide these matters been questioned in any way, and at no time has the management been called upon to bargain with the men collectively for wages, hours or conditions. The secret of the whole situation is that the management and the men have the utmost confidence in each other, both sides having always played fair and neither attempting to "put something over" on the other.

Another interesting feature of the White management is that no bonuses, premiums or other inducements are paid to employees. The highest possible wage on a straight-time basis is the plan of remuneration. This wage is established with careful consideration of the cost of living and amount of production.

In connection with the setting of wages there is a definite policy of increasing the hourly rate as fast as warranted by the individual production. The foreman is more apt to be called to account for not suggesting increases for his men than are the foremen in many shops for daring to suggest them. The theory is that, unless a workman becomes increasingly valuable to the company, there is something wrong either with the man in his present position or the foreman or both.

Care Exercised in Selecting Executives

Great care has been exercised in the selection of capable executives who are thoroughly in harmony with the general policies of the management, the company being particularly fortunate in having a number of men who have been connected with the company from ten to twenty years, and who are therefore thoroughly familiar with its policies. Men of this kind are particularly valuable as evidence to newcomers that conditions and relations are harmonious, and the effect is helpful in every way.

One of the striking features of the White plant is the complete freedom with which every employee is made acquainted with the problems of the management and the factors which enter into production. These are discussed not only in the committee meetings but in the *White Book*, which is issued monthly to each employee. The fundamentals of economics are clearly stated from time to time and all sorts of suggestions and questions are welcomed. The employees are told that "production is the great essential in a factory; for the whole community to maintain a comfortable and humane standard of living it is necessary for every man in the community to produce consistently, otherwise there will not be enough wealth to go around. The generally accepted idea and fear of overproduction is at bottom unsound and should not enter into the policy of either management or employees. There really can be no such thing as overproduction in industry. The term is merely a negative expression of the phenomena of underconsumption. Production means the creation of wealth. Without production a community will be without wealth and so will experience depression due to underconsumption.

"Production must first be arranged consistently with plant investment, inventories and personnel. These must be well balanced to attain maximum results for employees and management. Such activities as purchasing, stores, inventories, cost systems, maintenance and plant repairs, over which productive labor has no control and which, in the opinion of the management, it has no desire to be bothered with, are arranged to keep production standard and at a maximum. In this way it is made possible to earn the greatest amount with the least exertion and to build up a secure future for the employees in the factory.

"Second in importance to wages paid, in the mind of the average workman, are working hours. These must be regulated by the relation of earnings to living cost and by production, holding to the margin of safety between too long hours which result in inefficiency, and underproduction which endangers the future operation of the plant. It is the belief of the management that a community derives the highest benefit, social and economic, from maximum production paid for at a maximum safe wage rate."

Labor Not Bought at Lowest Price

The White Company abandoned the old employment policy that was in vogue something over five years ago of considering labor solely as a commodity to be bought at the lowest price. This has been fully justified in an increased production per man and a confidence and co-operation which mean more to any company than can be figured in dollars and cents.

The company's personnel department is now conducted on extremely modern lines, one of the most valuable employment officials being an ex-union labor leader, although this is an open shop in the true sense of the word no discrimination is made for or against members of any organization.

In hiring a man there are usually three men present besides the prospective employee. First the employment manager or his assistant determines the fitness of the individual for a certain class of work, after which the superintendent and foreman under whom he is to work are summoned. Together they secure a thorough understanding of the man's abilities and the sort of job he is to be fitted into is determined before he is finally placed on the roll. In a somewhat similar way, a man leaving the shop for any cause whatever is interviewed by these same men. This frequently brings out conditions which were unknown or not appre-

ciated and in a large number of cases results in an adjustment whereby the man goes back to his job or to some other department. This applies in cases of discharge as well as those who quit voluntarily.

No discrimination of any kind is made in regard to the nativity, politics or organizations of any kind. Only

three questions must be answered satisfactorily. These relate to whether the man is married or single, a resident of Cleveland, and if he has at least his first citizenship papers. No physical examination is required but may be had if the candidate for employment so desires.

[This is the first of two articles on the White Company's plan of management.]

Why the Blueprint?

BY FRANK RICHARDS

W. D. Forbes, on page 182 of the *American Machinist*, locates the first suggestion of the blueprint process away back in 1790. That may be the first suggestion to be found in print, which I doubt, but light printing dates far back of that. Last summer I saw several beautiful prints of lace upon the arms and breastworks of fair ladies at the beach, and such sun-printing must have been going on in the days of Cleopatra, only that her skin may have been too dark for satisfactory results.

The present talk about the blueprint seems to make an opportunity for me to say a few words about a matter that I have been thinking of intermittently for a long time. The blueprint was surely a godsend to almost the entire industrial world. It came upon us all at once, as you might say, about half a century ago, fully ready for work, and it found immediate and universal appreciation and employment. It never required and never had any advertising or any pushing save what it did for itself. It has never been to the interest of any individual to either advocate it or oppose it; since, on the one hand, it displaced or superseded nothing, there was no great business to be developed in connection with its introduction, and no education was required as to its manipulation. Today, its use extends all over the world and to all industries dependent upon graphic and dimensioned delineation.

Yet the blueprint, it must be confessed, has never been altogether satisfactory in any use we have put it to. It has never been a thing that any one has ever thought of treating with any respect in the handling. Neither the blue surface nor the white lines are what they should be, and the printing gives neither fineness nor clearness of line, and if the lines are crowded they blur and confuse each other. To compensate for these deficiencies of the blueprint it must be made larger and less easily handled and studied than would otherwise be necessary. It is a crude, rough product at the best, not demanding respectful treatment and not suggesting strenuous effort to keep it clean and smooth.

BLUEPRINT NOT LIKELY TO BE DISCARDED

I certainly could never have the hardihood to suggest that the blueprint is ever to be discarded, but I do venture to propose some lightening or dividing of its task. Without more ado I here call attention to Fig. 1, and it makes no difference to us here what it represents. It will at least be recognized as most likely to have made its first appearance as a blueprint, and as such it was probably not less than 30 x 20 in., and perhaps considerably larger. The cut as here presented shows every line of the drawing with perfect distinctness and must certainly be as clear and legible at every point as the blueprint. It can be seen more comprehensively as a whole at a single glance. As here reproduced it is a little less than the size of a post card, and its total area is less than 3 per cent of the blueprint area as above assumed. Why should I have any hesitation in asserting that for all the purposes for which the blueprint could or would be used, this black on white post-card drawing is much to be preferred? If not, why not?

Fig. 2, to which attention is now called, is a dimensioned working drawing of the steel frame of a standard railroad car. It is not a drawing prepared for my purpose, but one that I have picked up from some technical publication which I neglected to identify, and it is here reproduced without change. This cut is also within post-card size, and the scale of it is about

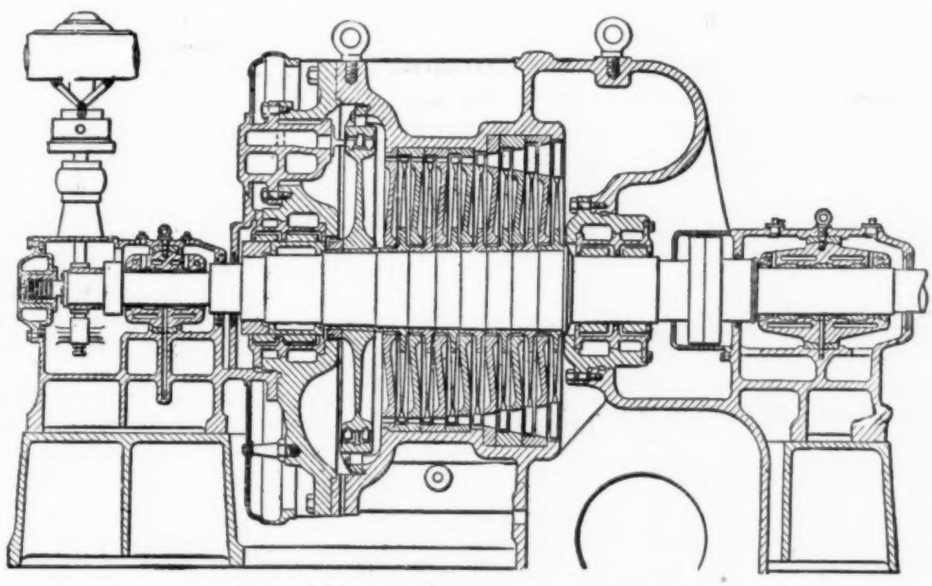


FIG. 1. REDUCED DRAWING OF A TURBINE

6 ft. to 1 in. It might have been reproduced precisely to that scale, or to any other as most convenient. The written dimensions, while as legible as could be expected, might have been made larger and heavier if our purpose had been in view. Now, what could the big blueprint tell anyone that this post card does not tell, and is not the post card handier and everyway to be preferred? Again, if not, why not?

The post-card shop drawing, if it should ever make a go of it, must shove itself along, just as the blueprint has done upon its merits alone and with no effective help outside itself. It is easy enough to turn it down immediately by suggesting the prohibitive cost of the scheme, and this is where a big surprise is lurking. The most astonishing thing is really the cheapness of it as compared with the result to be accomplished.

Photo-Engraving Process Is Not Costly

Probably few who have not looked into it fully realize how cheap and quick and handy is the zinc process of photo-engraving. We know in a general way that all the pages of a big dictionary and of entire, many-volumed encyclopedias have been reproduced by it, and how, when the printers' strike was on in New York, the pages of the *Literary Digest* and other papers were first typewritten and then photo-engraved for the printing; so it could not have been prohibitively costly. The process is awaiting the demand of the drafting room and is capable of working quite a revolution there. I think I have now in the process of writing this article sufficiently braced myself to enable me, notwithstanding what I said farther back, to suggest the giving up and abandoning of the blueprint entirely. See what would follow at once. There would be no more tracings, and only carefully finished line drawings which the draftsman could take pride in. These would be of any size most convenient for the working of the details, the photographing process ignoring the size of the original entirely and reproducing to any scale or size that might be desired.

Larger Sizes of Engravings

For our convenience here we have been carrying in our minds the post-card size, and that would seem to be large enough for the standard working drawings of a shop, but from the same drawing any other size could be produced with equal facility, up to, say, a square foot of area, which should be large enough to show all the lines clearly that would be practicable on the largest blueprint.

Assuming that the process which we are urging should find favor and should become the established practice, every big concern would naturally have its own photo-engraving equipment as a detail of its drafting department, and this should soon displace the blueprinting arrangements and drive them out entirely. The blueprint would cease to be, not only as the working drawing of the shop, but also as the unwelcome accompaniment of specifications, proposals, contracts and other responsible documents. In place of it would be the neat little cut which might not even require folding, and which one would instinctively stick in his pocket for preservation instead of throwing it away. In the literature—pardon the word—of business solicitation, the line cut would often be welcomed and studied where the blueprint would be discarded without a look. The paradox would result that the field and function of the blueprint would be extended by its extinction.

It would be a simple and easy job to make a trial of this thing. Select some standard shop blueprint from your lists and send the tracing of it, if there is no finished drawing, to any of the zinc-process engravers and have a line cut made of it within the post-card size. It might be that the lines would not be of the most suitable thickness, or the dimensions and written matter not large enough for the reduction required, and this would supply points for the making of a second drawing correct in these particulars which a second cut would verify.

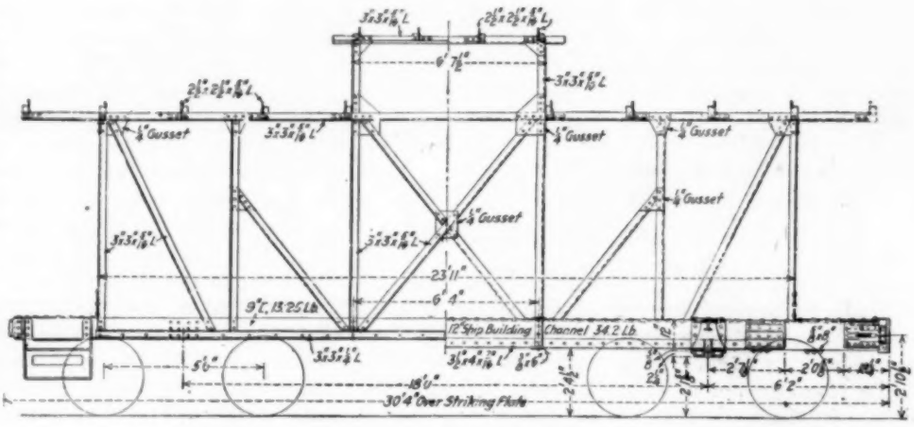


FIG. 2. REDUCED DRAWING OF A FREIGHT-CAR FRAME

The making of the first cut or two would also at once begin to bring information as to the cost of the process. The cost would of course all be in the making of the cut. Each copy printed from the cut would cost less than one-tenth of what each blueprint from the same tracing would cost, and would be of much more practical value. With the process fully established in a large works and all facilities provided, with reliable skill in the manipulation, the making of original cuts not larger than post-card size should cost not much over one dollar each. This is not mere guesswork but is deduced from information which I am not at liberty to make public.

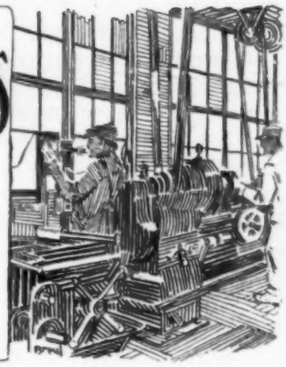
Unblocked Plates Easy to Store

There are details of practice that would develop which it is not necessary to speak of here. For instance, the cuts when completed are metal plates about ½ in. thick, and these plates are mounted on blocks of suitable thickness to make the same height as standard type, but for the purposes here contemplated it would be better not to mount them on the blocks at all but to print from the thin plates. This would save time and cost in preparation and also enable the cuts to be stored more compactly.

We ought to hear at once of some enterprising individual going to work and making an actual start on this thing. If not, why not?

MODERN PRODUCTION METHODS

By
W. P. Basset
of
Miller, Franklin, Basset & Co



Part II. Purchasing, as a Tool of Production

The purchasing agent's job is looked upon by some people as a snap, by others as a graft, but by up-to-date manufacturers as a very important position worthy of an able man. He has many chances to save money for the company and the smooth flow of the production stream depends to no small extent on his ability. Different buying methods are contrasted and some forms described.

(*Part I appeared in our April 8th issue*)

"THE motto "well bought is half sold," is an excellent one for the merchant, for price is important in trade. The same expression is a safe guide for the machine shop provided price is not made the sole test of good buying.

An eastern machine shop hired, as a purchasing agent, an ex-salesman who for 15 years or more had been selling to machine shops. Because he had been on the other side of the counter, he knew the "tricks of the trade." It was assumed that since he would be able to play upon the fears and weakneses of salesmen, he would make an unusually good purchasing agent. As a buyer he succeeded in playing one salesman against the other and his orders were unquestionably placed at the lowest prices on record. He assured his employers that the quality of his purchases was satisfactory. But the shop felt differently about it. Castings were of uneven hardness—and sometimes full of holes; belts needed constant attention and although the price paid for them was low, a lot more were bought yearly than before. Tools were often unsatisfactory and the maintenance cost of machinery and equipment nearly doubled.

What with increased overhead expense, higher labor cost, returned goods and decreased life of supplies, this "shrewd" buyer was an expensive luxury. It should not be necessary to point out that, in the machine-shop industry, the price of raw materials and supplies is really the least important factor of good buying for material is usually the smallest item of cost. It is more important that materials be the best for the purpose and that they be received on time than that they be bought at the rock bottom price.

All of these factors, however, must be kept in balance.

Poor Buying

One of the best purchasing agents in the machine-shop industry does the poorest buying I have ever seen. This man knows personally every source of supply, he is a shrewd bargainer, a good judge of quality and a marvel at getting deliveries through in record time.

He has few equals in getting in materials of which the shop is short, the lack of which is holding up production and causing serious loss of profits. So good is he at this that he habitually postpones buying until a shortage report jars into action his really phenomenal abilities. He is what I call the "grand opera star" type. He won't tolerate routine; he won't use his talents for the maximum good of his organization. His buying is to him an art; an exercise for his talents, rather than a tool with which his employer can make profits. There are many like him.

At the other extreme we have the purchasing agent who is merely an order-signing clerk. Where he exists, the shop superintendent, or perhaps an individual foreman, specifies what to buy, of what quality it shall be, how much to buy and when it shall be delivered. The buyer has little to do but specify the purveyor, and sometimes even that authority is taken from him. Where this method is used the purchasing agent has no chance to buy well, for shop men are inclined to wait until they run up against a need, and then to need it badly. Requisitions are for small quantities "wanted at once" and the buyer has no alternative but to place a rush order. The time given him and the individual orders placed are insufficient to enable him to buy to advantage.

Definite Statements Needed

It would seem obvious that production, the sole end of a machine shop, suffers under either of these ways of handling the buying. Without raw materials the shop cannot work, and if quality is not what it should be final costs will be high. It is not necessary to elaborate on these facts. But a definite statement of even the obvious sometimes is needed. Therefore, let us go on record that to make the purchasing department an effective tool of production, the following points must be considered:

1. Raw material must get to the shop *before* it is needed.
2. The amounts purchased must be in accordance with known future requirements of the shop, *neither more nor less than needed.*
3. The buyer must have sufficient time to enable him to buy well, except in occasional emergencies.
4. The materials must be the cheapest in the long run.
5. In order to achieve the first four points, the buyer

must have definite records of the past performance of all supplies, as to quality, price and delivery.

6. Fraud and clerical errors must be avoided by internal checks.

The last-minute buyer I have mentioned habitually violated the first of these rules. Time and again I have seen as many as 90 machines on the assembly floor, complete except for a small part which had been overlooked. These assemblies are worth—when shipped—about $800 apiece. That means that it is not unusual for $72,000 to be tied up for weeks at a time, because the purchasing agent has failed to place a small order for raw material. Obviously, the loss is greater than the mere tying up of working capital. Valuable productive floor space is being used as unproductive storage and congestion is caused at many points in the plant.

That is the effect of under-ordering or late ordering. Over-ordering is also an expensive practice.

What an Investigation Showed

A manufacturer of automobiles decided to find out why he required what seemed a huge amount of working capital to handle only a moderate volume of output. An investigation of his storeroom showed him.

Take one item alone—axle housings, which cost him an average of $35 apiece. He used from eighty to 120 a month and had, as a rule, little difficulty in getting prompt deliveries. His stock of these parts averaged 100 more than was needed to care for any likely emergency. The same condition existed throughout the stockroom. By regulating the purchases, he released nearly $175,000 of idle money.

This condition is bad enough, but it might be—and in many shops is—worse. The material overstocked might be obsolete. I have seen obsolete stock sold at less than 25 per cent of cost—a loss in one instance amounting to well over a quarter of a million dollars—all because of unregulated buying. Conditions of this sort exist as a rule where the size of orders is left to the judgment of the purchasing agent. It is emphatically out of his province to determine how much to buy, when to buy it and when it should be delivered. Those questions can best be settled only by someone closely in contact with the shop and the sales department. An exception occurs in a rising market when it may be good business to buy more than usual. This, however, should be done only after careful consideration of the future needs of the shop, the financial condition of the company, the facilities for storing unusual quantities of material and so on. It cannot well be decided by the purchasing agent alone.

Usually, purchases are instigated by the planning department. Even though no formal planning department may exist, there is someone who has knowledge of the needs of the plant, who can exercise this function. How the planning department arrives at the quantity of material to be purchased will be described in later articles of this series. In this article our only task is to show what is needed to make the purchasing department an effective tool of production.

Necessity of Routine

Routine is necessary and records must be kept, but neither should be elevated to an end, of itself. Sometimes production is facilitated by smashing routine for an emergency order. Records should be as simple as possible and only needed ones kept. I have seen the entire time of a clerk used to keep up records which might have a value to some learned society but which were never referred to by the buyer. Good sense must govern.

Often a report will be inaugurated for a temporary need, which will continue to be compiled long after the need has passed. It is well periodically to check up on all records and if they do not serve a purpose—throw them out.

The forms described here are simple and all are designated to aid the buyer to live up to the six requirements of good buying.

Let us consider the way an order is handled after the requisition is received by the purchasing agent.

The forms and routine for various shops need not differ appreciably, no matter what the size of the shop

QUOTATIONS

ARTICLE

MAXIMUM_____
MINIMUM_____
DESIRABLE ORDER_____

DATE	FIRM NO.	FIRM QUOTING	ON QUANTITY	PRICE	DISCOUNT	FREIGHT	NET COST PER UNIT	REMARKS

PURCHASES

DATE	FIRM NO.	QUANTITY	PRICE	REMARKS	DATE	FIRM NO.	QUANTITY	PRICE	REMARKS

FIG. 1. BUYER'S QUOTATION RECORD

nor what its product. The methods I am going to describe are now in use in shops employing twenty-five men, and also in shops having more than 2,000 on the payroll. Some of these shops do a jobbing business, building any kind of machines; one, on the other hand, builds gears, transmissions, differentials, etc.—thousands of a type.

When a requisition comes in, the buyer turns to the form shown in Fig. 1 on one side of which is the quotation record and on the other a record of purchases already made. There is a copy of this form for each item.

For convenience, each supply house is given a number, which is used rather than the name. The information on this card is a valuable guide in showing which concerns have given the best prices, and the promptest deliveries in the past.

In buying many productive materials and especially in buying supplies and tools a performance record is a valuable guide. Such a one is shown in Fig. 2. It consists of a manilla envelope—one for each article—in which can be kept memoranda and comments made

by the shop and others on the article. This is an invaluable guide to the buyer who keeps in mind that his function serves a bigger purpose than to buy cheap. The persistent use of this performance record saved one concern $5,000 a year on its belting alone, and $25,000 a year on one of its principal raw materials.

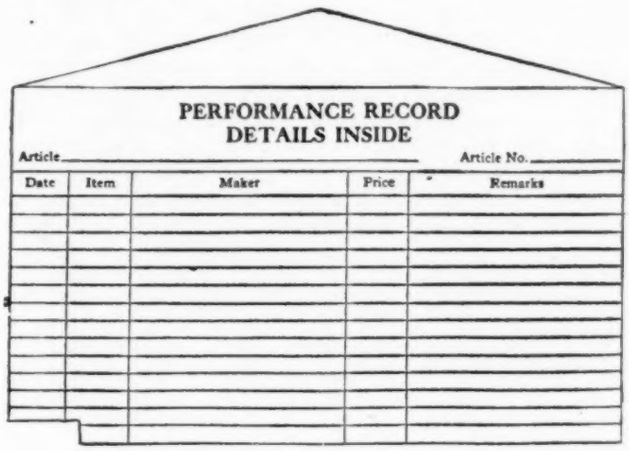


FIG. 2. PERFORMANCE RECORD ENVELOPE

This is how it came about: Belting had been costing this machine shop $17,000 a year. It seemed too much and the buyer decided to experiment with various makes and *keep a record.*

Belting Data Kept

In the envelope for belting he kept data as to every drive. He noted the location, the operating conditions, the power transmitted and other data having a bearing. When a belt was purchased, he recorded the description of the belt, the maker, price, the drive on which it was used; even the cost of the belt per unit of production on that machine.

With this data in hand, he had a guide more reliable than the usual foreman's guess, which is all that many purchasing agents have to go by. He bought on a basis of exact knowledge.

Formerly $17,000 worth of belting was bought annually. Last year he spent only $12,000 in spite of a 35 per cent increase in the plant's production and a 50 per cent increase in the average price of belting. This saving is all due to the fact that only the best belt for each drive is purchased. In addition to the direct saving of money spent for belts, there is an operating economy due to reduced shutdowns caused by belt troubles. It is expensive to pay for cheap belting with idle machines. The same method is used in judging the other supplies and raw materials used. Good judgment, knowledge of markets and of men still plays its part in this man's buying, but instead of dickering and jockeying for price advantage, he has a definite knowledge of his needs on which to base his shopping. Having settled upon the source of supply, the order is placed by means of a standard order form. At least three copies are needed, one for the purveyor, one for the purchasing agent, and one for the receiving clerk. Sometimes more copies will be needed, such, for instance, as one for the originator of the requisition.

The form in Fig. 3 shows a desirable design for the purchase order. If the nature of the business demands that frequently a large number of items be ordered at one time from a supplier, it is well to have order forms large enough. When only one or two items are ordered at a time, paper may be saved by having the purchase order correspondingly small.

On the left of the original copy is a perforated slip which the supplier is requested to return with a promise of delivery. This may be attached to the purchasing department's copy of the order.

Printing Purchasing Departments Copy

If most of the orders placed take a considerable time to fill, and a large amount of correspondence is usually necessary, it is handy to have the purchasing department's copy printed on the outside of a manila folder so that the order and all correspondence bearing on it can easily be kept together. As a rule though, only a few of the total orders placed require much follow up. Therefore, it is possible to have the purchasing department s copy printed on paper, and when needed, to paste it to a folder.

An excellent plan is to print this copy on cardboard or heavy manila paper so that it will stand on edge. This copy is used as a follow-up tickler so that deliveries may be watched. At the top of the order shown in Fig. 4 are numbers for the days of the month and letters representing the months. The dates promised by the supplier may be indicated on each order by tabs affixed to these letters and numbers.

The purchasing department is responsible not only for placing the order, but for getting the material into the plant. Hence the need for thorough and regular follow up. It should start when the order is placed. Each

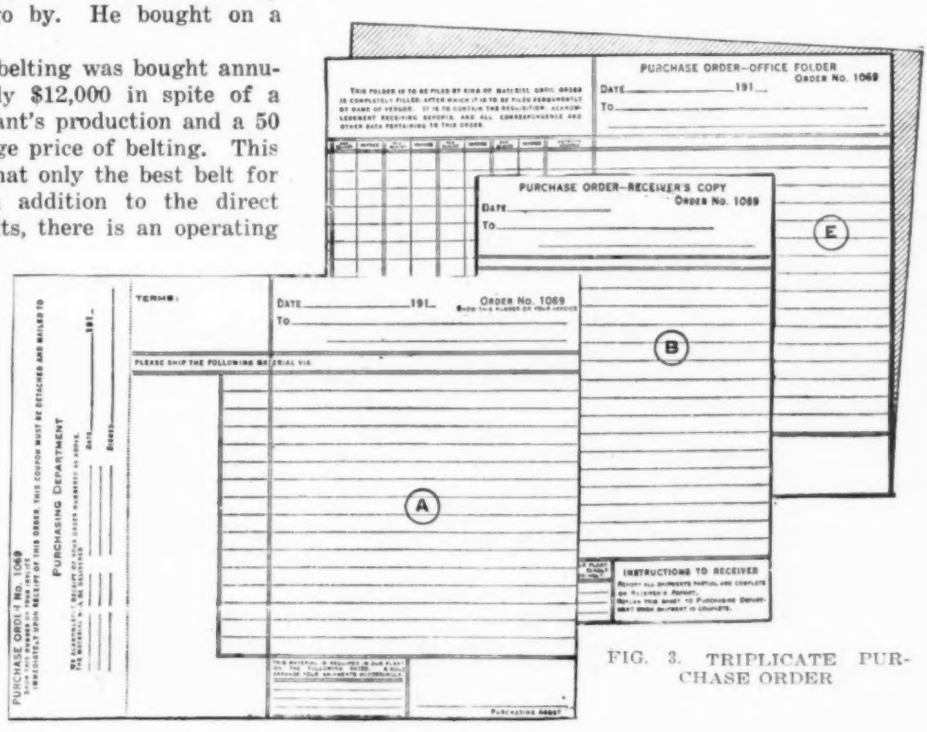


FIG. 3. TRIPLICATE PURCHASE ORDER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 J F M A M J J A S O N D

No. (serial) _____

_____ 19__

_____

_____

Please ship the following to _____

_____

_____

and charge to our account

Quantity	Description	Price	Shipping Date

Please observe the following instructions in packing, shipping and billing

Route Via	Terms

Very Truly Yours

By _____

Confirming { Verbal / Telegram / Telephone } Order of _____

FIG. 4. FOLLOW-UP ORDER FORM

day the one responsible for following up should go through the file in which the orders are arranged alphabetically by materials, and pick out, by means of the tabs, those orders indicated for attention on that day.

One Copy Goes to Receiving Clerk

One copy of the order goes to the receiving clerk. A valuable check will be supplied if the left-hand column of the order showing quantities be left off. This may be done by simply cutting the carbon paper so that the quantity figures or the original won't copy. This necessitates an actual count of the incoming material. Too often, a receiver, if at all hurried—and he usually is hurried at times—looks over a carload of material, "guesses" it is all there and turns in a complete receipt. This permits of dishonesty, and—what may be even more costly—may hold up production seriously because of lack of material supposedly received.

Sometimes it is also well to leave off the price from all but the original and the purchasing department's copy.

While for most concerns three copies of the order are enough, it is sometimes desirable to have more. For instance, it may seem well to send a copy to the cost department, so that it may enter the material costs on its records. In very large concerns, a copy is sometimes sent to the controller's office so that, knowing what payments are going to be called for in the future, sufficient funds may be provided when needed. If this is not done, the purchasing department should report monthly the payment's to be made for materials for the following month.

A simplified form of purchase order which may be used especially in the smaller plant is shown in Fig. 3.

When the goods arrive, the receiving clerk sends a material receipt, Fig. 5, to the purchasing department where the receipt is recorded on the office copy of the order. When the invoice for the material comes in, it is checked for quantity and price and sent to the accounting department for payment.

As can be seen, the forms and records of a properly run purchasing department are simple and each designed for a definite purpose. Proper records should

MATERIAL RECEIVED REPORT

DATE RECEIVED_____19__ CAR INITIAL_____CAR NO._____

PRO. NO. VIA WT.

			BOXES	BAGS	BARS	BUNDLES	KEGS	PIECES	PKGS	BARRELS	CRATES	
FREIGHT												
EXPRESS												

From Whom Received

ORDER NO.	QUANTITY	DESCRIPTION OR PART NUMBER	WGT	APPLY ON SALES ORDER

SHIPMENT CHECKED BY_____ DATE OF INVOICE_____

DATE PASSED_____

FIG. 5. MATERIAL RECEIVED REPORT

be a guide to future buying rather than a tally of what has been bought.

The buyer must remember that it is not his occasional "breaking of the market" or getting a delivery in a pinch which makes for profit. The purchasing department's function is rather to keep up a steady flow of the materials best suited to the need of the business. They must be on hand when and in the quantity needed.

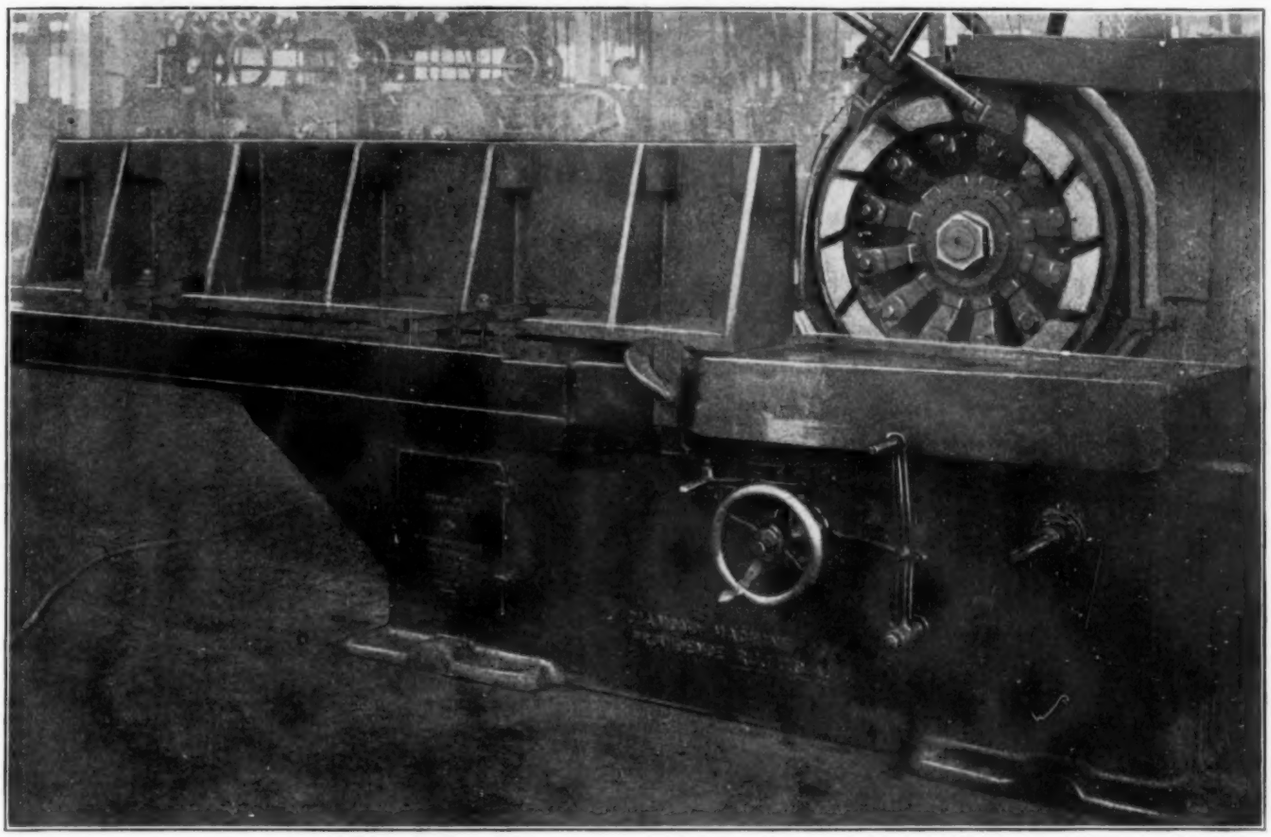
Purchases do not stand alone, but rather influence every part of the business. Probably no other function of a manufacturing concern has so great an effect on the profits of the business as a whole.

A Special Screwdriver

By Charles Hattenberger

Certain work which was being done at the Seneca Vocational School, required the use of some large fillister-head screws. To drive these securely in place required considerable power. This was secured by making a large screwdriver, as shown in the illustration, with a hexagon *A* integral with the shank. By using a monkey-wrench considerable purchase was obtained and the desired results were brought about. The screwdriver was made by a student at this school.

A HEAVY-DUTY SCREWDRIVER



Diamond Face-Grinding Machine and Its Work

By E. L. DUNN
Associate Editor, *American Machinist*

THE scope of grinding operations is practically unlimited, and grinding machines are now competing with many other types of machine tools in the finishing of work. The value of such operations is, however, more pronounced with certain classes of work. Irregular shapes, thin pieces, hard iron, etc., are factors that come under this classification. The Diamond Machine Co., Providence, R. I., has solved many difficult problems with its machines and methods, some of which are herein described. One of the large face-grinding machines made by this company is illustrated in the headpiece. The long angle plate shown on the machine table is for a magnetic chuck, a front view of which may be seen in Fig. 1. This chuck, it will be noticed, is in the process of manufacture, as it is being ground. (For a detailed description of this operation, see Vol. 51, page 913, of the *American Machinist*.) Fig. 2 shows the finished chuck in use, holding drop-forged pump links in position for grinding. The time required to grind these, removing $\frac{1}{16}$ in. of stock from each side, is at the rate of four links in $2\frac{1}{2}$ hours.

The development of grinding machines has probably advanced machine-shop production to its present state more than any other single agency. A close-up view of what is being accomplished in the grinding line is often surprising, even to those who are skilled in the art.

The segment wheel seen on the machine in the headpiece, and also in the line drawing, Fig. 3, has particular application to the removal of large amounts of stock, and is said to be equally effective in obtaining a good finish. The wheel is constructed as shown, the chuck being of cast iron. The chuck fits the tapered end of the spindle and is held by a large nut. The twelve segments form a circle, 30-in. outside diameter and 24-in. inside. They are 6 in. thick and are held in position by special clamps. Since nearly all of the stresses in a wheel of this character are radial, but little pressure is required to hold the segments in place. The clamping method shown in Fig. 3 is a simple arrangement that is said to be very satisfactory. The clamps are angular-shaped, pivoted at the ends, and when the screws are tightened the segments are forced against the inside rim of the chuck and held securely.

The machine is heavily built and capable of handling very large work; however, it has a wide range of usefulness and is adaptable to many forms of light work. In this connection the rotary device, shown in Fig. 4, has proved of value. It is used to rotate the work, thus facilitating the grinding of flat, true surfaces as well as the removal of large amounts of stock. The chuck is revolved by means of a small motor located inside the casing at the top, the drive being through a chain and worm gearing.

The pulley-grinding fixture, shown in Fig. 5, is driven

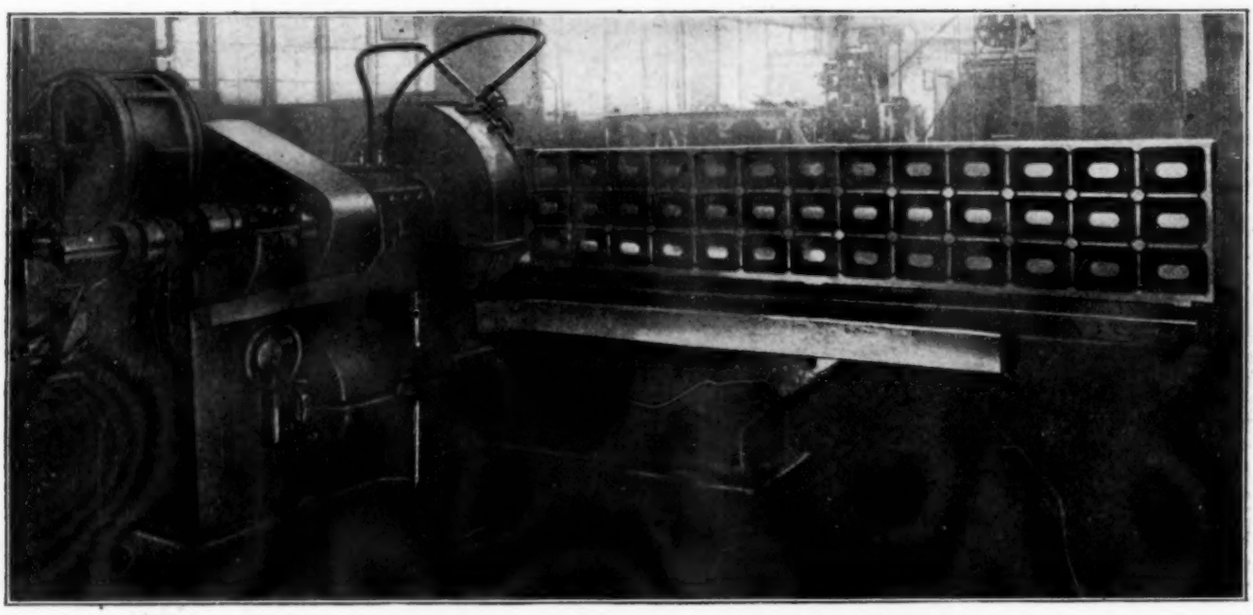


FIG. 1. FRONT VIEW OF PARTLY FINISHED MAGNETIC CHUCK

from the rotary device through a universal shaft. When grinding pulleys, a solid ring wheel is used. The extent of the crown may be varied by changing the position of the pulley in relation to the wheel. If the pulley was ground on the face of the wheel there would be no crown, and if ground on the inside surface there would be too much crown; hence by using the beveled corner, as shown in Fig. 5, the correct curve is easily obtained. As to production, 8 x 6-in. pulleys are finished from the rough in 2 min. each. Another advantage claimed for this method is that no pulleys are discarded on account of hardness. The pulley-grinding fixture is provided with a ball-bearing thrust and the worm gearing receives lubrication from a single grease cup of the compression type. The feed is by handwheel.

Another class of work handled advantageously by the Diamond face-grinding machine is chilled cast-iron plates, of the type shown in Fig. 6. They are 10 x 36 in. in size and the finished surfaces are ground flat

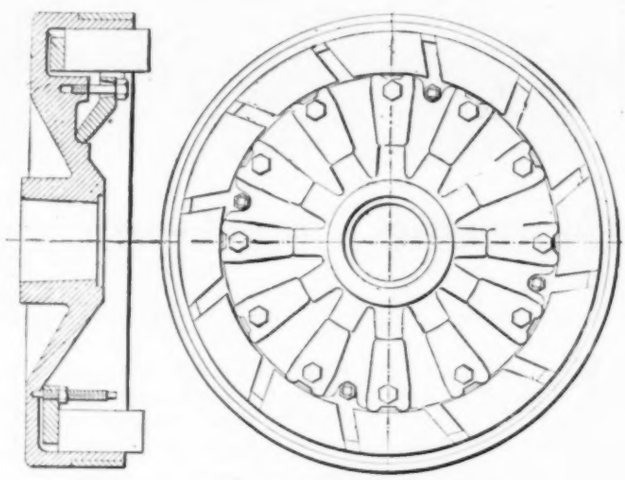


FIG. 3. DETAILS OF SEGMENT WHEEL

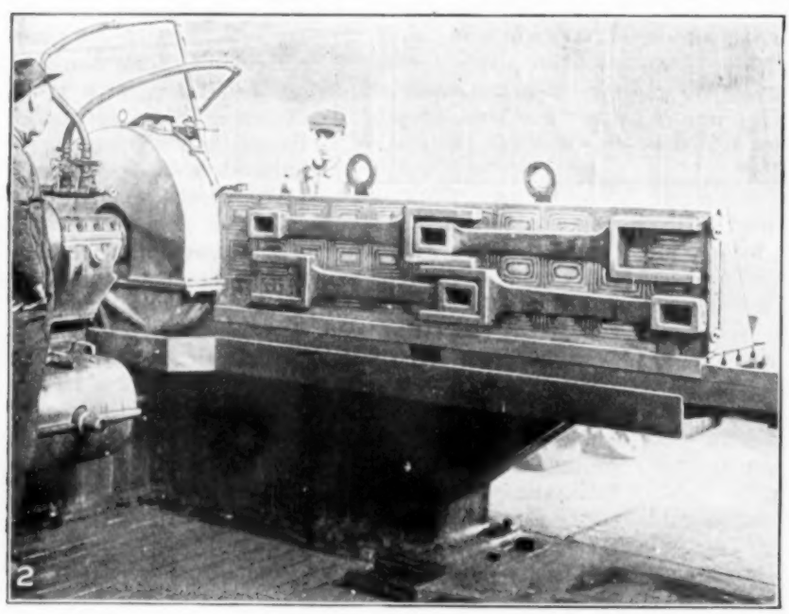


FIG. 2. FINISHED CHUCK HOLDING WORK

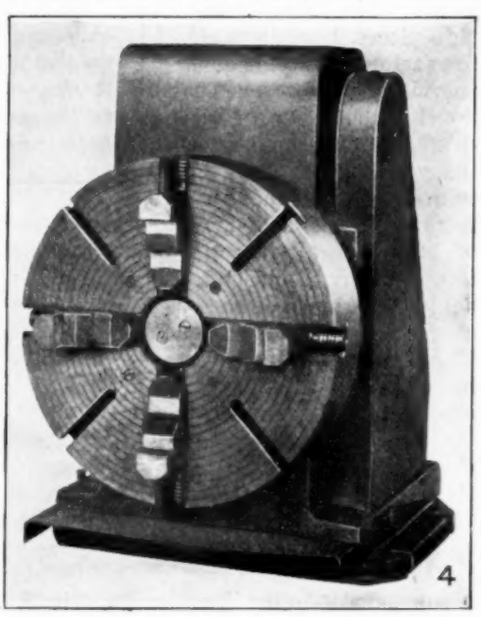


FIG. 4. ROTARY ATTACHMENT

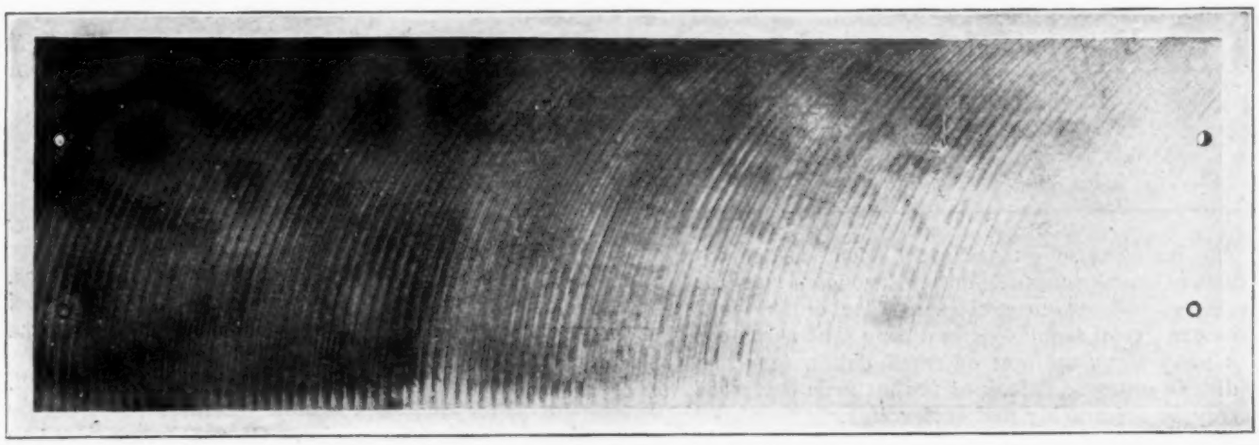


FIG. 6. CHILLED CAST-IRON PLATE

within 0.006 in. The time required is 18 min. for each plate. On account of the slight circular scratches in the polished surfaces of the plates, it was thought that it would be necessary to refinish them on a surface-grinding machine. This was found unnecessary as the same results were accomplished by a slight lapping with abrasive and oil. When grinding the ends of long, heavy

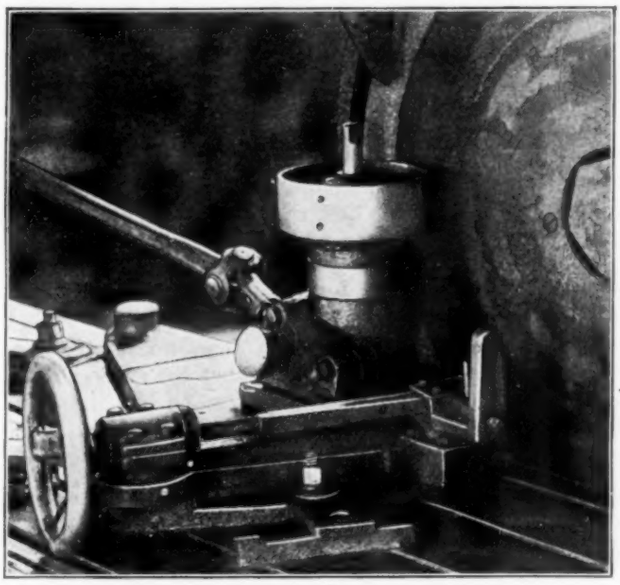


FIG. 5. PULLEY GRINDING FIXTURE

castings the work is handled in the same manner as on an open-side planing machine, where in the case of a long overhang, the outer end is supported on a roller table.

The segment wheel is recommended by the maker as being lower in first cost. The coolant solution recommended is 5 lb. of sal soda (sodium carbonate) to 45 gal. of water. The wheel segments are furnished in all grades.

The Life of an Airplane

The life of an airplane depends on two distinct assemblies: the power group and the structure of the machine. These have little in common, as far as their life is concerned, and their use requires different methods and usually a different class of mechanic for the upkeep.

Prior to the war the object of the designer was to get a machine that would fly, and little attention was paid to the durability of its parts. During the war it was discovered that the life of a machine in service was about three months, as it either was rendered obsolete or was crashed by the end of that period. This fact led most designers to sacrifice any considerations of durability in order to gain the prime military features.

Many of the larger aëronautical engine manufacturers of the world have remodeled most of their successful types with intention of increasing reliability. This has usually resulted in a slight increase in weight. Also the question of cost of overhauling has been gone into carefully and present-day engines are so designed that their accessories, valve gears, and similar parts are readily gotten at for cleaning and adjustment. The result is that most engines on the market today for commercial use can be relied on, with proper use and care, for from 125 to 150 hours without being overhauled. And if hoists, suitable benches, and other shop equipment are not available, valves may be ground and even pistons changed in many modern types without removal from the plane.

As mentioned above, war machines were designed for speed and not for durability. One feature, however, was developed as a result of the war which will have a great effect on the future use and development of aviation. That is the application of metal to the structure of the airplane. The Germans were driven to this by the lack of a reliable supply of suitable lumber. Some French and English firms also worked on this problem, notably Boulton and Paul in England and Louis Clement in France. Many inventors have brought forward alloys, new structural combinations, etc.

This development has been foreseen for many years, but presents a difficult problem. The effort to obtain the maximum of strength with the minimum of weight resulted in vastly refined types of internal structure and thorough investigations into the strength and properties of the available materials. All of this data and knowledge is now available to the designer who is working with the idea of durability.

The great shortage of good linen prompted an investigation of other materials as a substitute. Various weaves of cotton and cotton with linen were developed which have some properties of value that all-linen has not, besides being cheaper. Streamline wire was brought out of the experimental stage and can be obtained of equal strength and reliability with stranded cable.—*Automotive Industries.*

Handling Material at the Plant of the Greenfield Tap and Die Corporation

By PETER F. O'SHEA

The handling of quantities of small-sized products in process of manufacture through a machine shop entails many problems. The author tells how material is handled in a shop that turns out a good many millions of small gages, taps and dies in a year. A look at the methods described may be interesting and instructive.

AT THE plant of the Greenfield Tap and Die Corporation, Greenfield, Mass., the rear end of the steel shed is the beginning of a long, low, single-story cutting-off shed where bar steel is cut up into short lengths as blanks for taps and dies. This building contains a long row of Nutter-Barnes cold saws, ranging all the way from the 3-in. to the 12-in. size.

The bars are put into the building through the side windows, from a driveway along the outside of the building. There are as many windows as there are saws, so that the most of the wall is windows. A truck may drive up alongside and by raising the proper window the bar stock is pushed in beside the saw which handles that size of steel. Each sill has a steel roller fastened upon it to facilitate sliding in the stock upon the piles.

Since each pile of stock may be 4 or 5 ft. high, a large quantity of steel is usually on hand in this shed. This obviates a lot of additional storage space. Moreover, as each pile is opposite the saw that is to handle it, no further handling of the rods is necessary, except to pull fresh rods into contact with the saw as wanted.

The material travels from left to right, coming in at the windows at the left as raw material, and falling into the aisle at the right in the form of blanks. Trucks are used to gather up the blanks, and, as the cement floor of the aisle and the passage to the main building and its floor are all on the same level, trucking involves the least effort.

Blanks Made in Bulk for Stock

Blanks for each size of tool are made in large lots, on orders applicable to blanks only. The lots called for on these orders are larger than orders for any given size of taps or dies. The blanks are put into partly finished stocks, and can be drawn against for any of the proper sizes.

The stockroom is wired off into a separate cage, has a wicket in the wire door, and is furnished with a desk for the stock clerk and a few racks for the more unusual blanks which are made in small quantities.

Blanks made in large quantities are stacked in boxes on the floor. Each box of blanks is formally received into the stockroom by the clerk, who inspects and counts the contents. This count he adds to an inventory card. The card stays with the box or boxes of blanks, one card to a size. The card has five columns, one each for the date, the amount received, amount issued, the order number, and net amount on hand. Each card therefore not only gives the current inventory of its size of blank, but gives the complete history of the number of blanks that passed through the stockroom, and what orders they were issued for.

The smaller sizes of blanks are stacked in small boxes. Some of the bulkier blanks are stacked in deep boxes on the same wooden truck platforms on which they came from the cutoff room.

From the stock cage all work is issued in small, shallow boxes, holding a standard number of pieces by count, according to the size. Of the larger size, 50 constitute a boxful; the smaller sizes contain as many as 200, or even 500. In no case is the boxful heavier than can be picked up by one man and handled quickly to and from his machine.

When an order is issued for a given number of pieces, as many order and routing tickets are made out as there will be boxesful needed to round out the order. One ticket, in a celluloid envelope to keep it from being soiled, is tossed into each box, after being marked with the letter corresponding to which instalment it is of the complete order. The order may therefore be sent forward in sections, provided enough sections are kept coming to supply an uninterrupted stream of work for the machines in their present set-up, and provided not so many sections are sent out so that they clog the stream.

Each work ticket accompanying a box shows the number of pieces in the box, the total number of pieces in the order, the number which have previously been routed through, and the number still to follow. The workmen as well as the foremen can therefore tell the progress of the work.

All stockrooms are caged in. A door in the wire has a spring lock with a latch inside. Since the stock clerk's desk is some distance from this door, he has rigged a strand of wire from his desk to the door-latch, so that he may admit anybody without walking to the door.

How the Size of an Order Is Determined

The frequency and size of the stock orders are determined in the administration office.

The sales department keeps statistics of its sales, including the quantity of each kind and size of product. From these statistics are determined the quantities of each product that should be kept in stock in the main stockroom ready for shipment. The stock is a reservoir which should be equal to the total demands of thousands of scattered customers, who order in all sorts of quantities, large and small. The minimum stock on hand must be enough to take care of all reasonable or expected demands.

The stock supervisor or the sales department and the general superintendent agree as to the amount of stock and the amount of each product which shall constitute a standard shop order. The sales department sees that it shall be sufficient to cover needs, and the general superintendent sees that the standard amount shall be economical to route and manufacture.

As soon as the stock for an article gets down to the minimum quantity the stockroom clerk sends a requisition to the production supervisor of the manufacturing department for the standard quantity. The production

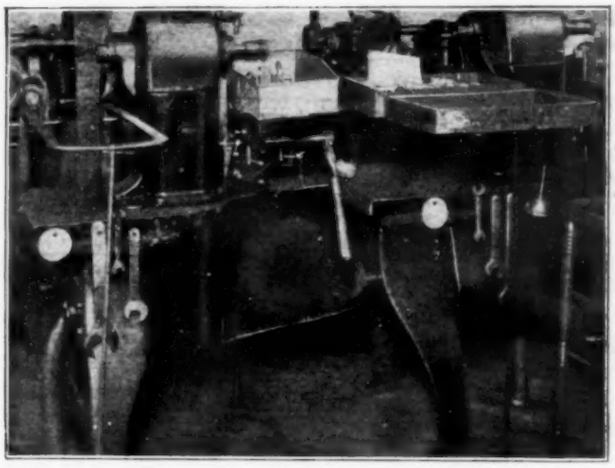


FIG. 1. BRACKET ATTACHED TO MACHINE AT ONE END; OTHER END SUPPORTED BY A ROD FROM THE FLOOR

supervisor then makes sure that he has the requisite amount of proper raw material stores on hand, and that the factory is not clogged too much with other work but what it can fit this order in. He then gets a promise of delivery from the factory itself and sends down the order. At the same time he tells the sales-department stock-supervisor when he may expect the finished order to be in the stockroom.

The Production Man

There is also a production man under the works manager. It is up to him to see not only that the order can be made or that the material is in the stores, but that the material is moved out of the stores and that the order is made and how it is going to be made, by just which machines, and on what schedule. He knows the individual machines by their machine numbers, and the workmen, and the detailed difficulties that are apt to come up at certain points.

The production man therefore takes the order as it comes from the general superintendent's department, and applies it. He has made out a standard routing card on which the necessary processes are printed in proper succession and opposite each process he writes in, in the second column, the department which is to do the work, and in the third column, the particular machine which is to do that process on that order. The next column is left blank for the workman to fill in the time he received the work. Columns are also provided for the number of pieces which were in each box when the workman received it and when he sent it on, so as to show any shortage from spoiled work.

These cards therefore determine the movement of the product from point to point in the factory.

The trucks used for moving material inside the factory are small, light and of a peculiar pattern. They are 36 in. long by 20 in. wide, built with a box-like frame-work of angle-iron, so that the surface of the truck is 30 in. from the floor. The top is of wood bound on the edges by the angle iron of the frame. The two strips of framework which bound the right and left edges of the top extend out from the truck for 5 in. at each end to furnish a hand hold and are the only handles. This truck is pushed, not pulled, by these handles.

The trucks are handled by young men called "bell boys," of whom there are a corps in each plant. When an order of product is ready to move, it is loaded upon one of these trucks; the bell boy consults the move card, gets hold of the truck and pushes it on its way.

The trucks gradually move from department to department from the cut-off or automatic room to the final inspection room at the front of the factory. Therefore, whenever a bell boy has an errand to take him toward the rear of the factory he takes an empty truck back to its starting point.

From the ground floor to the second floor a single elevator is rendered sufficient through proper routing of the work. The second floor contains the tap and reamer departments, where so much of the processes are done that when the work comes down it is on its way to the hardening room and does not have to be taken upstairs again. No material goes up on the elevator except blanks for taps and reamers.

Handling Work To and From Machines

The same shallow wooden boxes in which instalments of shop orders are issued from the stockroom are used at the machines. Each machine is provided with some sort of a resting place for a box of blanks, and another resting place for an empty box to receive the work as fast as the process is done on each piece.

The box of blanks is generally placed where the left hand of the operator will naturally reach, and the product box at his right hand. This order is reversed in case two machines are so related that the one on the left does the next process following that of the machine at the right. In this case the product box of one machine is the blank box of the next machine, and may be situated midway between them, with room for an extra box in case one machine gets ahead of the other.

The form of the resting place for the product box varies. In some cases it is a small table or bench. The resting place for the work box is sometimes on the truck which brought it to the machine, and which is backed up and left there. Another truck is stationed on the other side of the worker, with empty boxes on it to receive the finished work. The workman automatically does the loading of the truck; thus, the product can be wheeled away without rehandling.

A convenient form of support for work boxes is a bracket made of strap iron, attached either partly or completely to the machine, and supported by it. The form of bracket attached only partly to the machine, Fig. 1, is composed of a strap of iron bent into the shape of a U having about 18 in. between the arms. The two ends are bent down and holes bored for fastening the bracket to the base of the machine. Under the

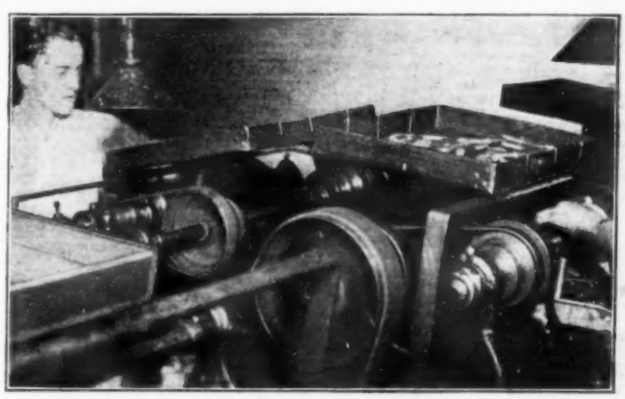


FIG. 2. BRACKET FOR SUPPORTING PANS TO SERVE TWO MACHINES

middle point of the U a half-inch iron rod is put, reaching to the floor. Since the strap-iron ends are fastened firmly to the machine, this makes a rigid support.

The bracket is light, inexpensive and can be applied to the most convenient point of almost any sort of machine. Near the front and back ends of the bracket sharp steel points are inserted. These engage the wood on the under side of the product box and prevent it being shoved off by accident.

Another economical bracket for holding work boxes is made of strap and angle iron. This bracket is above the machine and is composed of a rectangular frame parellel with the machine, and raised above it on four legs, one at each corner. The legs fastened to the front of the machine are shorter than those at the rear, so that the frame slants downward toward the front. The lower or front edge of the frame is made of an angle iron with the angle up, so that it forms a lip that prevents the boxes placed upon the frame from sliding down. The upper or rear bar of the frame is made of flat strap iron.

A double form of the same bracket is shown in Fig. 2, and is used where there are two machines back to back. Here the side members of the bracket are of double length, bent in the middle at the proper angle to give the right slant at the front and rear. The bracket spans both machines. Two of the legs are fastened to the front of one machine, two to the front of the other. The bracket holds work for both operators, each operator's work facing him at the proper slant and at a convenient position over his machine.

Boxes Front and Rear

In another department there is a machine set up for practically the same operation all the time. It is necessary for the operator to hold the work in place against the cutting tool with his hand, while at the same time locating the cut from lugs in the chuck. By placing the product box on the rear of the machine, he is able to simply let go of the product as quick as the cut is finished, instead of bringing it forward again. This speeds up his work by a considerable ratio. The same idea is used in other processes and machines.

In fact, in a great many machines the principle is used of delivering the finished piece of work to a receiver as close to the cutting point as possible. For instance, the receiving mouth of a chute may be shoved up directly under the cutting point, or within a few inches of it. Such chutes discharge either into a product box or pail on the floor, or to a product box at the next machine which is to do the next process. Waste motion is thus cut to the minimum.

Chutes of galvanized sheet iron thus used were described in the *American Machinist* on page 1,069, Vol. 50. The same article on page 1,068 calls attention to the method of stopping the fall of small threaded work into product pails, by wooden blocks or buffer boards to check the speed so that the threads will not be injured.

Work, especially dies, is handled mostly in shallow, flat boxes of wood through the factory. Large taps above 1-in. pitch diameter are up-ended in boards having holes bored to receive them. These boards also count the work automatically, as the number of holes is standard. In trucking, several boards are piled one on top of the other, each board resting on the up-ended taps in the board below.

Reamers are handled in similar boards or deep blocks. A toolman in the reamer department has designed special boards, all of the same outside dimensions, and divided into smaller compartments, by strips of ½-in. wood, the number of compartments varying on the different boards according to the size of the reamers they are to hold. Thus, sixteen small reamers may fit on one board, while only twelve of a larger size will fit on another.

All work arrives at the final inspection room in the same boxes, boards or trays in which it was handled through the shop. As fast as it is inspected and passed, however, it is put into standard steel pans, except the large taps, which are left up-ended in boards.

Inspection

Each workman has a tolerance gage on his machine, usually a snap limit gage, and workmen who deal with the threaded portion of taps and dies have thread limit gages.

There is a floor inspector in each department who makes the rounds and tries out with an inspection gage, either of the snap limit or the rapid inspection snap variety, the product of the machines, thus catching any error that may have occurred in the set-up or the wear of the tools used.

All gages are set and adjusted by a gage supervisor for each division of the plant.

Bench inspectors inspect the product as it is brought to them after each group of processes and usually work with rapid inspection gages. In some cases they also count the work and keep a check on it.

In the automatic room, for instance, where small tap blanks are cut from bars, the pails of blanks from the machines are taken to a bench in the end of this room. Here the blanks are not only inspected for size and counted, but they are arranged in boxes with the standard number in a box. For instance, half-inch taps are handled 400 in a box. This function performed by the inspectors for small taps is the same as that done by the stockroom for dies and large taps.

The inspection department has another bench installed in the tap department. Here taps are brought in pails or boxes after each group of processes and must be passed by the inspectors before going on to the next group. This keeps the finished product of the correct accuracy.

Before each process inspection, the oil is removed from between the threads of the taps by washing in hot soda water.

As each box or pan of product reaches the hardening room, the foreman places in it a slip which gives instructions to the workman for the hardening heat, tempering heat, and time for tempering bath.

After coming out of the tempering bath an inspector tests each batch of work with a file and quickly catches any irregularities in the results of tempering. The proper tests, by the way, for the hardening of taps is that the file should neither slip over the steel as if it were glass, nor bite in, but just barely take hold.

By the time the product is ready for sale, it has received fifteen inspections. Thus, it is certain not only that the final product is pretty nearly right as to dimensions, but that spoiled work is caught as soon as it is spoiled, and is not handled uselessly beyond that point. One or two wrong pieces in a thousand may not only lose a reputation for the manufacturer, but they may also cause considerable trouble through the shop itself.

In the final inspection room every dimension on each

individual piece of product is gone over with limit gages and examined with a magnifying glass for roughness of threads, or cracks due to tempering. To catch any concealed flaw, each tap is put into a torsion tester before being finally passed.

The final inspection room is partitioned off at the extreme front of the building. There is nobody in the room but inspectors, so they can concentrate their attention on their work.

The last process is to clean the product thoroughly with gasoline and cover each piece with vaseline to prevent rust, and then pack in steel pans.

Into each pan is tossed a "count slip" which shows, not the theoretical number of pieces that would be in the pan if it started with the standard number and none were spoiled, but the actual number of finished pieces in that particular pan. There may be, for instance, 397 instead of the theoretical 400. This slip was especially useful during the war, when shipping difficulties arose simultaneously with an increased Government demand for small tools. More pans were needed to handle the product, but could not be got in time. Therefore, the plan of standardized numbers of pieces in every box was temporarily abandoned, and as many pieces were put into each pan as it would possibly hold. Under these circumstances the count slips became especially important.

Cutting Screws of Quick Lead

By L. A. Dixie

Some day some enterprising American lathe manufacturer is going to market a lathe on which one can cut almost any screw from, say, 40 threads per inch up to a lead of 6, or even 12 inches. In order to do this all that will be necessary is a slight lengthening of the headstock of the lathe, the introduction of a single small pinion and washer, and a slight change in the manner of mounting the tumbler gears. In this article I am going to tell him how to do it, so that after he reads, it will be up to him.

The lead screws of foreign lathes are, or at least used to be, not only much larger in diameter than those of American lathes but they are also much coarser in pitch; for instance, when I served my apprenticeship, the lead screw of a Scottish engine lathe of 20-in. swing was from 2 to 2½ in. in diameter and at least of ½-in. lead. Lathes of 10-in. swing had leadscrews of ¼-in. lead. The change gears had from 20 to 120 teeth, rising in increments of five.

In this country, however, one seldom sees lead screws coarser than ¼ in., and generally they are as fine as ⅛ in. lead on lathes up to 18-in. swing. For this reason the gear ratio must be much higher and the stresses on the gear teeth greater when cutting rapid leads. In our shop we recently have had to cut a number of screws of this kind and several methods have been employed to do the job, all of which are old, but

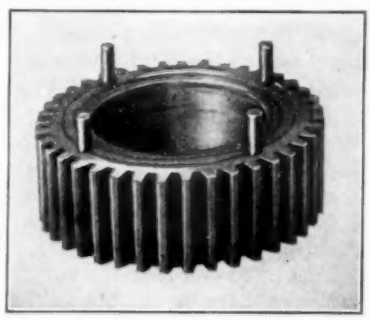


FIG. 1. THE NEW PINION

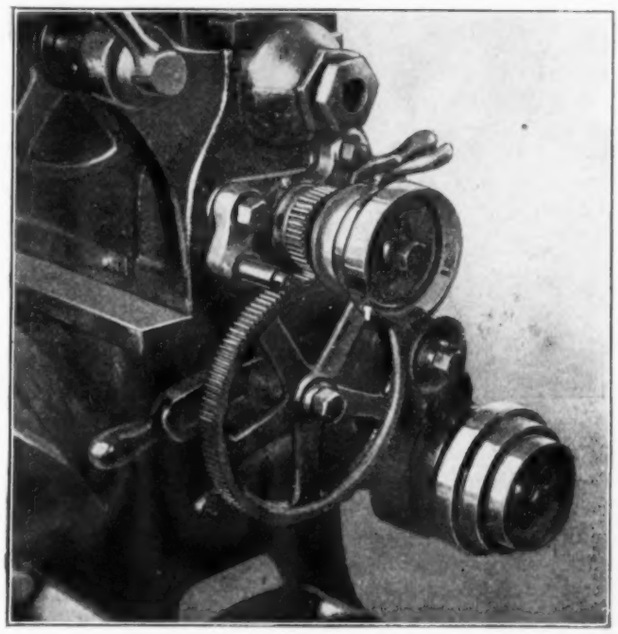


FIG. 2. CHANGE GEARS SET UP TO CUT 3 IN. LEAD

there is one that is so little known and so superior that it should be given publicity.

The usual method of placing a large gear on the stud and a small one on the lead screw is so well known that it is unnecessary to do more than call attention to it. The second method—that of driving the lead screw direct and turning the spindle through gearing from the lead screw, although not so well known, is not uncommon. The third method is so simple that it has always been a wonder to me that no lathe maker has incorporated it in the design of his product.

The speed of the cone with relation to the speed of the spindle of the ordinary engine lathe depends on the ratio of the back gearing. In conventional engine-lathe construction a pinion secured to the small end of the cone drives the large gear on the quill of the back gear and the pinion on the quill drives the large gear which is keyed to the lathe spindle.

For cutting coarse threads the lead screw must turn faster than the spindle, the speed ratio of course depending upon the lead of the lead screw relative to the thread being cut. With the back gears engaged, the cone is already turning faster than the spindle, so it is obvious that if we can arrange to transmit the power directly from the cone to the leadscrew through suitable gearing we will increase the speed of the latter without the disadvantage of increased gear ratios an consequent increased gear-tooth pressures. The change-gear ratio required to cut a given pitch would thus be reduced in proportion to the ratio of the back gears.

For instance, let us say this ratio is six to one and the lead of the screw one-sixth. Under the usual conditions with equal gears on stud and screw the resultant lead would be one-sixth, or, as commonly spoken, six pitch (single threads only being considered). If the transmission were direct from the cone, the lead would be one inch.

Several lathes in the shops of the Taylor & Fenn Co., Hartford, Conn., have been adapted by Mr. Wilkinson, foreman of the lathe department, to cut coarse lead worms and oil grooves. The method of adaptation is as follows: The pinion that drives the tumbler gears is

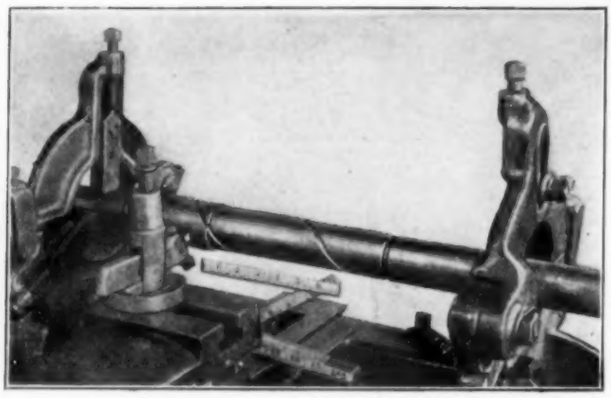


FIG. 3. CUTTING AN OIL GROOVE 6-IN. PITCH

replaced by a pinion of the same width of face and number of teeth, the new pinion being pinned to the cone pinion and turning loose upon the spindle. Fig. 1 shows the new pinion with the pins fitted tight in it but loose in the cone pinion. The cone with the new pinion attached to it is slipped on the spindle and the spindle put back into the head and the boxes adjusted. With this arrangement the spindle can, as usual, be driven by the back gearing, but the tumbler gears engage with the new pinion which is pinned to the cone pinion and turns with the cone.

Fig. 2 shows the change gears of a lathe thus equipped, set to cut a lead of 3 in. In Fig. 3 the lathe is cutting an oil groove with a lead of 3 in., and in Fig. 4 the shape and setting of the tool for doing this work may be seen.

In designing a lathe to incorporate the features above outlined, there are some points which must be borne in mind.

An extra pinion the size of the spindle pinion will have to be attached to the cone pinion. This will necessitate the keying of the spindle pinion further from the cone by an amount equal to the width of face of this extra pinion.

As the tumbler gear will be required sometimes to engage with the new pinion and sometimes with the regular one, it must be made to slide on its shaft in a direction parallel to the lathe spindle. Means must be provided so that it can be locked in either position, as some unthinking operator may attempt to engage the tumbler gear with both pinions at the same time.

Probably the simplest way to avoid disaster from this cause would be to put a washer between the two pinions, the outside diameter of which should be equal to the outside diameter of the pinions between which it is placed.

Fig. 5 shows the arrangement of new pinion and tumbler gears. To illustrate the advantage of this arrangement we will assume, as before, a lathe in which the back gear ratio is six to one and the screw of $\frac{1}{8}$ in. lead. With even gears on stud and screw and the tumbler gear meshing with the regular spindle pinion, the lathe would cut a screw of $\frac{1}{8}$-in. lead, duplicating the lead screw. By shifting the tumbler gear lengthwise of its shaft so that it would mesh with the new auxiliary

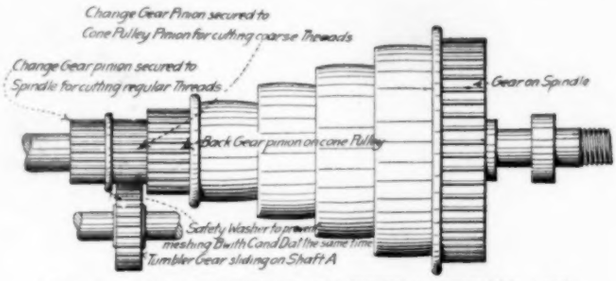

Change Gear Pinion secured to Cone Pulley Pinion for cutting coarse Threads
Change Gear pinion secured to Spindle for cutting regular Threads
Gear on Spindle
Back Gear pinion on cone Pulley
Tumbler Gear sliding on Shaft A

FIG. 5. ARRANGEMENT OF EXTRA PINION AND TUMBLER GEARS

cone pinion the resulting screw would be of 1-in. lead, no other change being necessary.

Another thing that the lathe designer will have to bear in mind is that the ratios of the back gears will have to be something definite. In many lathes, as at present constructed, this ratio is a more or less complicated fraction. This will have to be changed so that the speed of the cone is some exact multiple of the spindle speed.

FIG. 4. THE TOOL

The Trials of Old Baldy—IV.

By A. R. Durant

Old Baldy, the somewhat autocratic boss of the old Ajax Works, though austere and forbidding on first acquaintance, possessed a strong sense of humor and a commendable respect for justice. He could tell a bluffer as far as he could see him, and occasionally put one of them on the payroll apparently for the sake of having some fun with him.

One such came to work one morning and after falling down on several minor jobs Old Baldy asked him if he could run a "Dutch planer." Mr. Bluffer looked longingly out of the tail of his eye at Slim Benson, who was sitting on a soap-box and leaning comfortably against a post as he presided over the deliberate movements of the big planer at the end of the shop, as he replied: Oh, yes! I ran one for years up at the old Dingumbob works—the biggest one in the shop, too!"

"Well!" says Baldy, producing a 14-in. bastard file from a nearby bench drawer, "here is the biggest one we got; you can take the roughing cut over that row of castings there on the bench."

Mr. Bluffer took a cut 'cross-lots in the direction of the nearest saloon. He hasn't come back yet.

Common Errors in the Designing and Machining of Bearings*

By CHRISTOPHER H. BIERBAUM

After presenting ten principles relating to the design, construction and operation of journal bearings, based on what is now known concerning the laws of lubrication, the author discusses among other things oil grooves and their proper distribution, the disadvantages of tight-fitting bushings, proper methods of finishing brasses to provide for expansion when running, and proper methods of clamping bearings during tooling. He then takes up the matter of the tools employed in machining bearings and shows by numerous photomicrographs of finished surfaces the importance of using sharp tools with the proper rake in order that the crystalline structure of the surface material of the bearing may not be so crushed and compacted that it will fail to function as a normal bearing alloy.

IN CONSIDERING the subject of bearings, their design, construction and lubrication, it is desirable to have in mind the fundamental laws discovered by Tower, Thurston, Goodman, Lasche, Stribeck and others. Taking the work of these investigators in the light of what is now known concerning these laws, it follows that in the operation of a properly designed, constructed and lubricated bearing we may lay down the following ten principles:

1. The bearing surfaces are completely separated by a film of oil.

2. The friction of operation is the fluid friction in the oil film, and adequate thickness of film is essential.

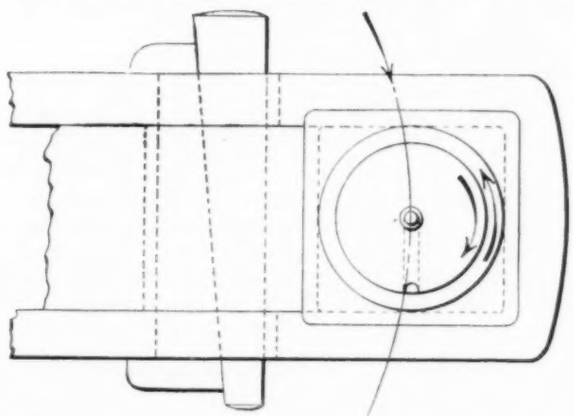


FIG. 1. EFFICIENT METHOD OF LUBRICATING A CRANKPIN BEARING

3. During construction proper clearance or space should be provided for a normal thickness of oil film.

4. The advance edge of a bearing surface must be rounded or chamfered off in order to permit a supporting film of oil to form.

5. The oil film forms most effectively upon a bearing surface, the advance edge of which is at right angles to the direction of motion.

*From a paper presented at the Annual Meeting, December, 1919, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York.

6. An increase of speed increases the thickness of film, all other conditions remaining constant and clearance permitting.

7. An increase in the viscosity of the oil increases the thickness of film, all other conditions remaining constant and clearance permitting.

8. The larger the unbroken film of oil, the greater will be the average pressure-supporting capacity per unit area, other conditions remaining constant.

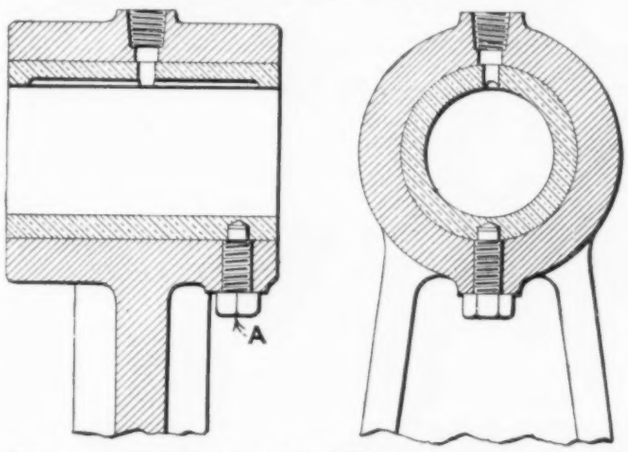


FIG. 2. SECTIONS OF AN ORDINARY BUSHING DRIVEN INTO A CAST-IRON HOUSING

9. Every unnecessary oil groove or interruption in the continuity of the oil film reduces the supporting capacity of the film.

10. For every bearing condition there is a film thickness corresponding to maximum lubrication efficiency.

The law governing the proper thickness of oil film has not as yet been investigated to the extent that the importance of the subject demands. In modern machinery the average thickness of film varies from 0.0002 to 0.006 inch.

Precautions Regarding Oil Grooves

The application of the known laws can be discussed to the best advantage by considering specific cases. Fig. 1 represents a theoretical ideal, as well as a practical and efficient, method of lubricating a crankpin bearing, the journal receiving oil through the crankpin. The rotation of the crankshaft is in the direction indicated by the upper arrow, and in the position shown the engine is on a dead center at a point of reversal of pressure. The direction of relative motion of the rubbing surfaces is shown by the two arrows at the right of the figure. The oil film enveloping the right half of the crankpin has been completely restored during the stroke just finished, since the oil groove passed over this half of the bearing while no pressure was being exerted upon it. After the dead center has been passed, the entire pressure is then exerted upon the crankpin with its fully restored oil film, and at the same time the oil groove wipes over the other half of the bearing and restores its oil film while no pressure is being exerted upon it, after which it in turn is ready to receive a reversal of pressure upon a fully restored oil film. Thus, both halves of this

crankpin bearing present alternately, for the maximum pressure of each stroke, a complete and uninterrupted surface for maintaining the film on an area equal to the projected area of the crankpin, but it is impossible to obtain so perfect a condition of lubrication in a bearing having the old-fashioned cross oil grooves which are still too often found in this class of bearing.

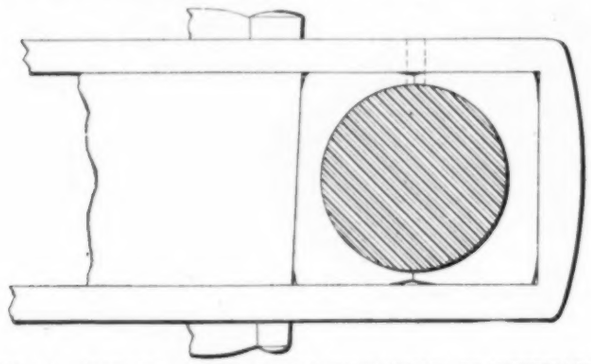


FIG. 3. PROPER METHOD OF FINISHING CRANKSHAFT BRASSES TO PROVIDE FOR EXPANSION

In many cases oil grooves are necessary evils, which should be minimized as much as possible by avoiding a useless excess of grooves and especially grooves in the direct line of maximum pressure of the bearing.

Disadvantages of Tight-Fitting Bushings

Fig. 2 shows a transverse and a longitudinal section of an ordinary bushing driven into a cast-iron housing. As all bearing alloys have a coefficient of expansion higher than that of cast iron, and as the bearing is directly subject to the friction of the journal, it follows

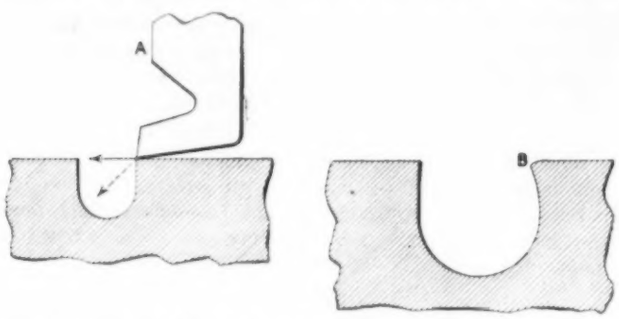


FIG. 5. SHARP EDGE OF AN OIL GROOVE PRODUCED BY AN ORDINARY TOOL

that the bearing is at a higher temperature than the cast-iron housing and must have an appreciable outward expansion when in operation.

When a bushing is driven in too tight, although it has been reamed before being placed in service, the amount of clearance which it will then have becomes a matter of guesswork and the amount of oil-film space provided an uncertainty. The idea that bushings must be driven in tightly in order to hold them in place is fundamentally wrong. For all ordinary machinery it will suffice if a bushing may be driven in place with a blow of the hand or with a small block of wood. The provision for fastening the bushing in place should be such that it will not bind or clamp the latter against outward expansion. In the construction shown in Fig. 2 a setscrew engages a hole in the bushing, but does not, however, bottom in the hole.

Fig. 3 shows a crankpin bearing finished in a manner providing for necessary expansion in service. The edges of the half-bearings should bear solidly against each other and should exert a pressure against each other somewhat in excess of the maximum crankpin load. The outer surface of both bearings near these edges should be relieved so as not to bear upon the straps, as shown, somewhat exaggerated, in Fig. 3. The four corners of the bearings should be relieved in like manner so that the horizontal thrust will be mainly borne upon the surfaces falling within the area of the

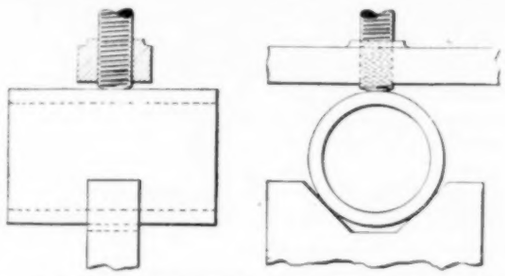


FIG. 4. IMPROPER METHOD OF CLAMPING A BUSHING FOR TOOLING

horizontal projection of the crankpin. A bearing thus constructed expands with the first slight increase of temperature, relieving the crankpin instead of clamping it as when these precautions are not taken.

Mention may here be made of a class of bearings which together with their supports are often improperly designed; namely, self-oiling ring bushings. These are nearly cut in half at mid-length in order to provide space in which the ring may operate, and the supporting wall beneath the bushing is slotted correspondingly at the center to permit the insertion of the ring into the oil well. This often unduly weakens the bearing at a point where normally the greatest film pressure is exerted. In general, much of the trouble at present encountered in bearings can be overcome by simply increasing the

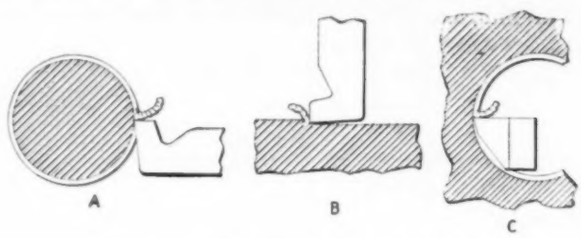


FIG. 6. IMPROPER FORMS OF TOOLS

strength and rigidity of the bearings and their supports, since an insensible amount of distortion and deflection is sufficient to produce all manner of annoyances.

Bearings Should Be Clamped Endwise for Tooling

Fig. 4 shows end and longitudinal views of an improperly clamped bushing. With a ⅝-in. 16-thread setscrew and the application of, say, a 50-lb. pull upon a 12-in. monkey wrench, a pressure of 50,000 lb. can be carelessly exerted upon the bushing in question. Bushings tooled when clamped in the manner shown seldom have a bore that even approaches a true cylindrical surface, and if they are then driven upon an arbor and finished on the outside a very inaccurate product is the result. The best and most satisfactory method of holding bushings for tooling is that of clamping them endwise.

The matter of chamfering oil-groove edges deserves

special attention in that all advance edges of a bearing should be rounded and chamfered off, and the fact that this work should be done after all of the other tooling has been completed, is important. At *A*, Fig. 5, is shown an ordinary lathe tool at the edge of a groove on a finished surface. There are two forces exerted upon any surface which is being tooled, one horizontal or parallel to the finished surface and the other vertical or in a direction normal to that surface. The resultant of these forces is a force indicated by the dotted arrow, in a direction tending to deflect the edge of the groove obliquely downward, producing an effect which is shown somewhat exaggerated at *B*. An injurious effect is produced in a bearing if any tooling is done after the oil grooves have been cut, especially so if the direction of rotation of the journal is opposite to that of the tooling. In all cases sharp edges of the groove prevent the formation of an adequate oil film and should be carefully avoided.

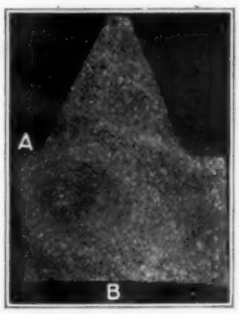


FIG. 7. CROSS-SECTION OF ONE OF THE TEETH OF A WORMWHEEL

For best results it is necessary that a cutting tool should have rake. The tools shown in Fig. 6 would be readily condemned even by a person with a very limited shop experience, and no journeyman machinist would think of setting a lathe tool as shown at *A*, a planer tool as at *B*, or a boring tool as at *C*. In the last-mentioned case the amount of radial pressure which it exerts upon the finished surface is far in excess of what is necessary. Consider, now, the standard multiple-cutting-edge reamer which is very often used in finishing bearings. A 2½-in. reamer would have, say, fourteen edges and the amount of bursting or internal pressure that it would exert within a bushing would be at least fourteen times that exerted in case the bushing were reamed with only one improper tool as shown at *C*.

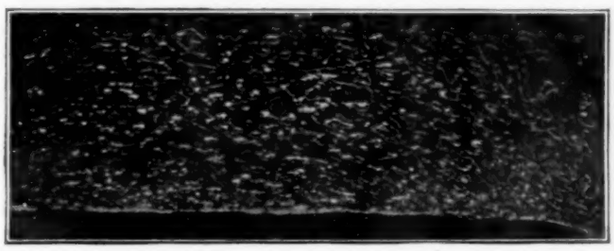
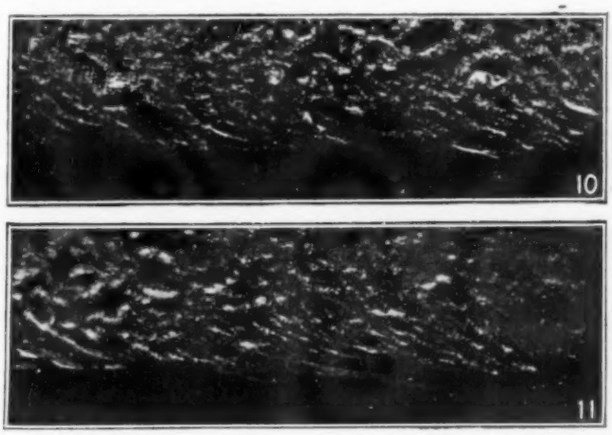


FIG. 8. PHOTOMICROGRAPH OF FIELD AT *a*, FIG. 7 (60 MAGNIFICATIONS), SHOWING DISTURBANCE OF CRYSTALLINE STRUCTURE DUE TO THE USE OF A DULL TOOL IN HOBBING

The final finishing in bearings should be done by reamers or cutting heads having only one or a limited number of cutting edges, and these cutting edges should have the proper amount of rake—such as would be given to any other proper cutting tool. Experiments made in a large manufacturing plant on bushings of the same dimensions, from the same lot of material, finished at the same time, some, however, being reamed with the standard multiple-cutting-edge reamer and others with a single cutting blade, showed that after a storage of six months those bushings which had been reamed with a proper single cutting edge retained their accuracy and shape much better than those finished with the so-called standard reamer. The latter bushings exhibited a decided tendency to decrease in inside diameter and to assume inaccurate, elliptical forms.

FIG. 9. PHOTOMICROGRAPH OF EDGE *b*, FIG. 7 (90 MAGNIFICATIONS), SHOWING THAT A SHARP TOOL PROPERLY GROUND WILL NOT DISTURB THE CRYSTALLINE STRUCTURE

In order to obtain the full value of bearing alloys it is necessary that these alloys should be presented as bearing surfaces having their natural crystallization undisturbed. The hard or bearing crystals should be embedded in a softer material, permitting the former to adapt themselves to the journal surface. The softer crystals under proper service conditions will wear slightly below the surface of the harder crystals. In order to retain these conditions it is necessary to preserve the natural crystallization upon the bearing surfaces, but this cannot obtain where they have been mutilated by improper tooling. This mutilation of the bearing surfaces gives rise to the crushing of the harder crystals and embeds these crushed particles into a compressed material which does not function as a normal bearing alloy.



FIGS. 10 AND 11. PHOTOMICROGRAPHS OF THE INNER EDGE OF A BUSHING FINISHED WITH A DULL BROACH (60 MAGNIFICATIONS), SHOWING MUTILATION OF THE SURFACE MATERIAL

An illustration of this is furnished by the bronze wormwheel of a certain motor-truck drive in which the teeth had been finished with a dull hob, Fig. 7 showing a cross-section of one of the teeth. After giving unsatisfactory service the wormwheel was examined in the usual way by chemical and physical tests, neither of which showed any defect whatsoever. On the other hand, microscopic examination showed that the trouble was due to improper tooling. Fig. 8 shows a photomicrographic section of a field at *A*, Fig. 7. This view clearly shows that the natural crystallization of the greater part of the area has been distributed, and that the edge of the tooth has had a cold-rolled or wire-drawn effect produced upon it by improper tooling, which proved to be the sole cause for the very unsatisfactory performance which this wheel gave in service. Fig. 9 shows a magnification of part of the edge *B* of Fig. 7, the inner edge or surface of this wheel from which it is centered upon

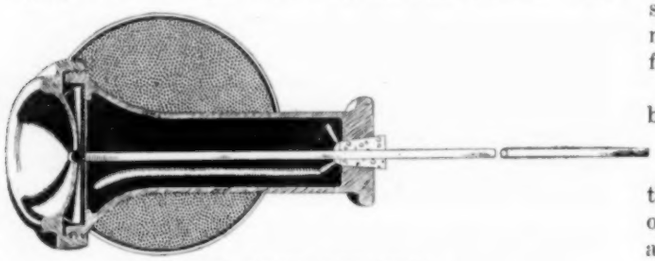
its spider. This surface had been tooled with a single cut, the tool ground and set so as to produce a smooth finished surface, showing that it is an easy matter to cut a bronze surface satisfactorily without distorting the natural orientation of its crystalline structure.

Figs. 10 and 11 are photomicrographic sections of the inner edges of a bronze bushing which had been finished by broaching with a dull broach. These micrographs show that the surface material has been distinctly mutilated and that the compression of the material upon the bearing surface is very uneven, and they prove conclusively that this treatment is not conducive to best service requirements.

A Sound Detector

By Cyril B. Clark

The article by D. C. Cook entitled "Locating Knocks in Motors," and published on page 1064, vol. 51 of *American Machinist*, brings to mind an experiment with a similar device, but for an entirely different purpose. Our plant covered considerable territory and was equipped with a sprinkler fire-protection system. Two



THE SOUND DETECTOR

large tanks held the immediate water supply and at the time of which I write it had been discovered that about 12,000 gal. of water was getting away every twenty-four hours by some unseen course.

An old telephone receiver was procured, the magnet removed and a drill rod of about No. 8 gage was attached to the inner side of the diaphragm. The wire extended two feet or so from the small end of the receiver case which latter was bushed with a common cork to prevent the wire from rattling against the sides of the hole.

With this device we went "looking" for the run-away water. It was a short job. Outside of every building were one or more valves to control the water supply from the mains underground. The stem packing of several of these valves was found to be leaking and as the plant was beside a river and the soil was porous the water got away unnoticed.

With the sound transmitter a very small leakage could be distinctly heard even though six feet under ground.

Repairing Expansion Reamers

By W. F. Hollis

The expansion reamer shown in the cut is a rather fragile tool, and to throw one away when broken, especially if it happens to be a new reamer, is a disheartening loss; but to be able to save them for further use instead of scrapping them is a saving of importance—a practical example of true conservation of resources.

They usually break at the end of the slots as shown at *A* and *B* where the blades join the solid body and as a result of one of the following causes: by a novice not being sufficiently cautious when using a new, sharp reamer and overfeeding it to the point of sticking, or "hogging in"; by those who desire to enlarge a hole "just a trifle" more and who, misjudging the amount of expansion the tool will stand, screw in the expanding plug until they overstep the limit of the blades; or, when the reamer rolls off the bench onto the floor.

To repair the reamers when thus broken, reduce the diameter of pilot or wrench end (or both ends for that matter, which has often been done) $\frac{1}{8}$ in. and of suffi-

REPAIRING AN EXPANSION REAMER

cient length to allow the fitting on of a tight steel sleeve well over the broken ends of blades, and they will be reclaimed to do service for years to come.

Having seen dozens of reamers broken in the manners stated, I think it would be a matter of good business for the makers of such tools to adopt a policy of drawing the blades at the weak point, as indicated, to a spring temper, thereby giving them a longer life; for many who do not know how to repair them, refrain from buying them on account of this weakness.

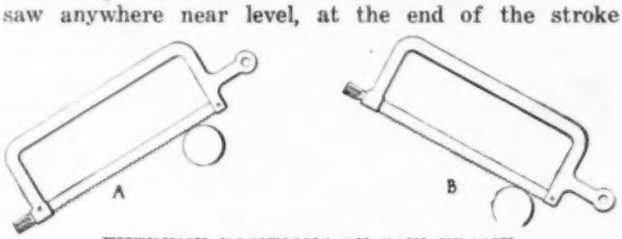
As a further precautionary measure, the reamers, before and after being used, should be incased in a piece of standard commercial ribbed-rubber tubing. This not only stops them from rolling but should they accidentally be dropped on the floor the chance of breakage will be greatly lessened. It also serves as a protection for the cutting edges.

Converting a Shaping Machine to a Power Hacksaw

By Hiram Hicks

I would like to ask Wm. Denton who, on page 307 of *American Machinist*, describes the conversion of a shaper into a power hacksawing machine, what was the range of sizes that the machine was capable of covering, without vertical movement of the tool slide (which involves personal attendance)?

If he put a 2-in. bar in the vise and started the saw anywhere near level, at the end of the stroke

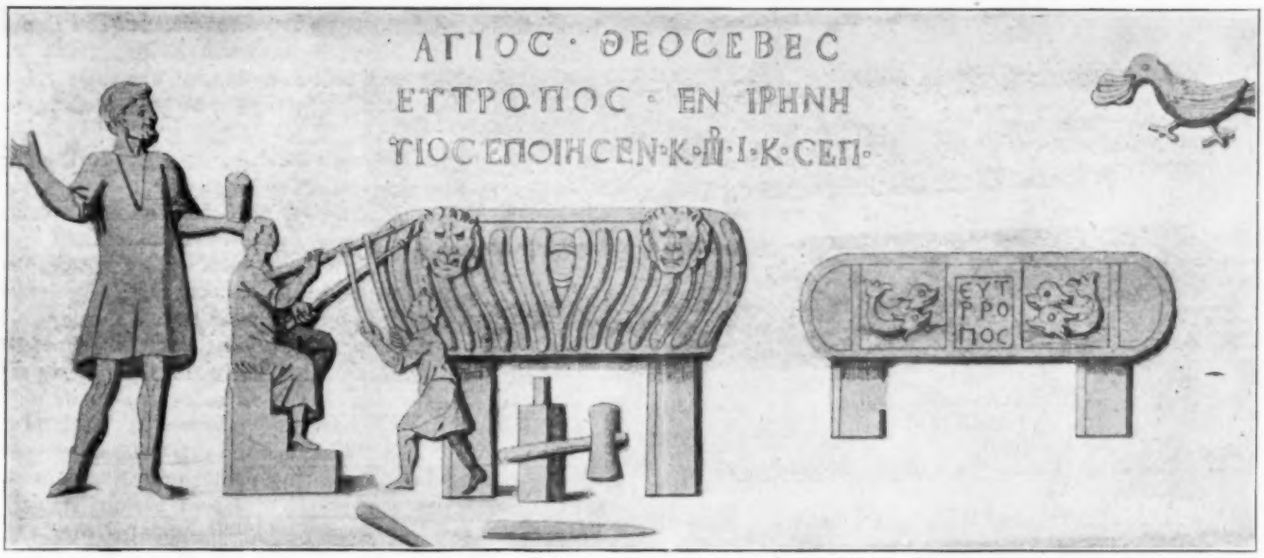


EXTREME POSITIONS OF SAW FRAME

the saw would occupy the position shown at *A* in the illustration, unless it were held up by the limiting screw; in which case it wouldn't saw. If he started the saw with the tool slide low enough to cut clear through the bar without further attention the saw frame would assume the position shown at *B* as the ram came forward.

If he set the tool slide in the middle he would get both movements (at different parts of the cut) without reaching the extreme of either.

In any case, in my opinion the saw would promptly "bust."



The Evolution of the Workshop—VIII

By H. H. MANCHESTER

The Second Half of the 18th Century

The discovery and use of coke to replace the rapidly vanishing supply of charcoal is responsible for the rejuvenation of the English ironworking industry. Various government publications in both England and France afford excellent records of the advancement in this period which just precedes the machine-tool era.

(Part VII was published in our April 1 issue.)

THE best sources of information in regard to the machine shops come from England and France. The patent lists of England give some idea of the machines which were thought to be in demand, while a number of highly important industrial treatises published in France present us with splendid engravings, illustrating the more advanced conditions in the shops of that era.

In England the new prosperity of the iron industry, due to the use of coke to take the place of the failing supply of charcoal, gave rise to a score of important inventions in this field as contrasted with practically none in the previous half of the century. The mere fact, however, that an English patent was allowed was no proof that an invention had not already been experimented with abroad.

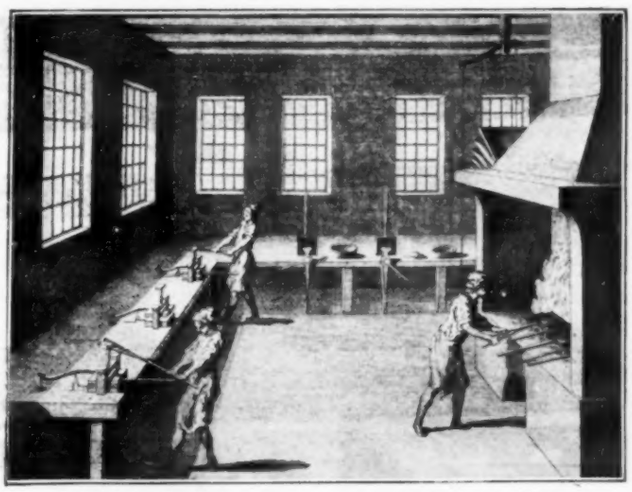


FIG. 48. PRIMITIVE DIE PRESSING IN FRANCE

In 1759 a patent for rolling metals with shaped rollers was allowed to Thomas Blockley. This had been attempted before, but how successfully is uncertain. An important idea was involved in the patent allowed to James Knight in 1762. This was to place the ball of hot iron from the furnace into a screw engine, which was worked by a heavy fly, to flatten the ball, and the cutters which were in the same box as the press were to chop or slit it into blooms.

An interesting invention of 1768 was that of George Whately for plating wire by placing a silver strip on top of it with borax between and drawing out the two.

The rolling of metals was probably being carried on successfully at that date, for in 1769 we find Richard Ford patenting a machine with multiple rollers for this purpose. In 1774 Thomas Griffin attempted to use a windmill to furnish power for stamping and rolling such material as tin foil.

The increasing use of the lathe is suggested by the patent of William Sheward in 1775 for finishing the eyes of needles by means of a lathe carrying a small drill or a reamer.

What may be considered an advanced notice of the milling machine is the patent of John Talbot in 1778 for a circular file, or cutter, or large toothed wheel for taking the outer cut or surface off metal. The idea of pressing with dies is involved in that of William Bell in 1779 for pressing out metal buttons and buckles between rollers into which had been cut the proper design. The general conception of the possibilities of rolling was rapidly advancing, for in 1783 William Playfair took out a patent for the rolling or stamping of horseshoes; while Henry Cort, the same man who invented puddling, received a patent in 1784 for welding iron fagots by rolling, after heating them in a furnace. Two years later John Butler suggested the use of grooved rollers to produce various shapes of bars and bolts. In 1790 John Wilkinson received a patent for

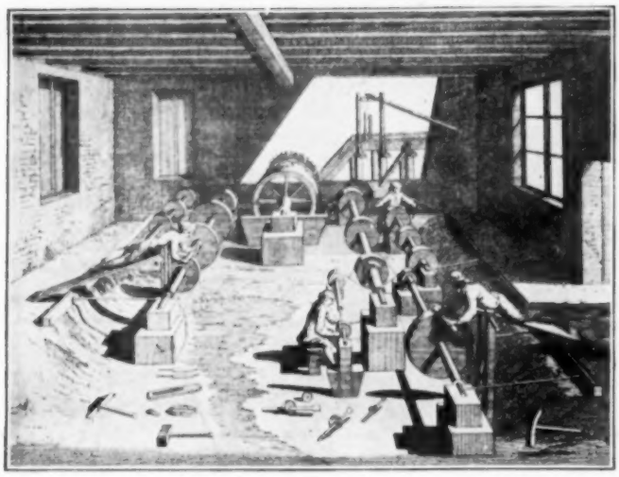


FIG. 49. GRINDING CUTLERY

drawing and rolling lead pipe, and two years later devised an alternating motion for rollers to allow them to be rolled back and forth over a plate. Another patent for a series of rollers for use on metals was granted John Hazeldine in 1798.

The use of the lathe was likewise increasing if we may judge from the fact that in 1793 Samuel Benton invented a reciprocating lathe to be used, as he put it, for bending and curving, boring, mortising, turning and chucking.

It will be observed that although Watt invented his steam engine in 1767, there was, up to the close of the century, no notable attempt to apply it to machines for the working of metals. These seem to have been limited to the use of muscular and hand power. This is evinced not only by the list of English patents and other evidences of the conditions in England, but even more strongly by the industrial treatises published under the patronage of the French government.

These treatises on various phases of industry were embodied in the "Arts et Metiers," the publication of which began in 1761 and extended over some 10 years, and in the "Encyclopedie des Arts et Sciences," the printing of which commenced in 1762 and likewise extended over a number of years. The illustrations in these two publications are much the same, but those in the "Encyclopedie Methodique," the first volume of which appeared in 1785, show a good many changes which had taken place in the meantime.

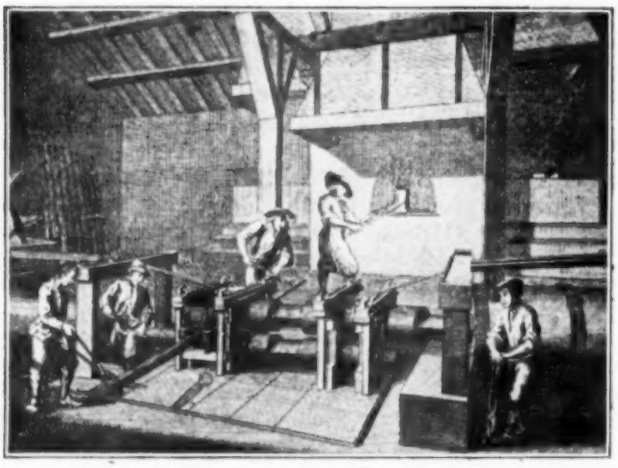


FIG. 50. A SLITTING MILL FOR IRON

From the viewpoint of the evolution of the shop from hand work to machinery, it is almost as important to note the work that was still done almost exclusively by hand, as that to which machines were already beginning to be applied.

In a treatise of 1761 we find that in the forging of anchors, water power was in common use to work the bellows and the tilt hammer, and hand cranes were employed to help move the material, but the rest of the work was practically all done by hand. One noticeable improvement was a springing bar at the top of the rise of the tilt hammer to give it an impetus for the blow.

In nail and pin making the heading machines, already mentioned under the date of 1718, were still in use as well as were the turning of the wire for pin heads and grindstones run by flywheels for sharpening the points.

In brass work in 1764 an ordinary tilt hammer was used for plates, and interesting variations in the form of the hammer for beating out vessels of various shapes. A representative engraving of 1767 indicates that the methods of the period in an ironworker's shop involved the use of various forms of forges, anvils, vises, tongs, files and hammers. Other plates of the time are more or less copies of those published fifty years before, and

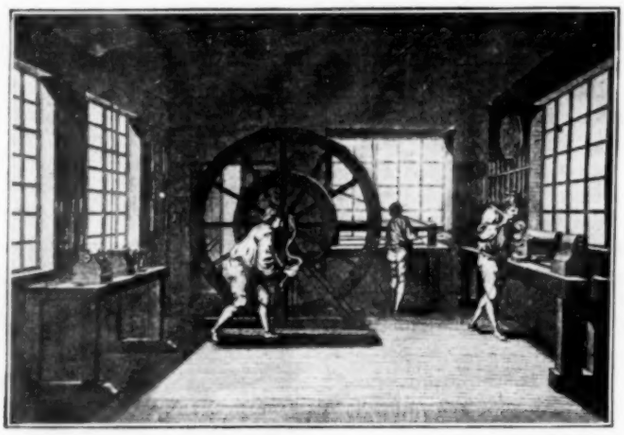


FIG. 51. IRON-WORKING LATHE WITH CRUDE SLIDE REST

show that hand work was usually employed in beating and punching out ornaments and iron. One interesting subject of 1767 is the making of springs for coaches and wagons. The only type shown as in use for that purpose is the strap spring, the work being done by hand.

A treatise of 1771 on cutlery illustrates a shop with a forge, anvils, and various tools. The grinding was done with wheels often turned by hand. There was considerable work with a file, and the finishing was likewise hand work.

In the making of the finer instruments, such as were used in surgery, however, we find various small machines employed. One form of a lathe was used for turning lancets, and other forms for various other surgical instruments. Lathes were regularly in use for boring small holes with exactness. A very important picture in this treatise, Fig. 48, illustrates an early form of die pressing in which some of the small instruments were actually pressed out by means of molds and some form of squeezer. Another interesting cut on this same subject, Fig. 49, depicts a sharpening room where the grindstones are turned by waterwheels through shafts and belts, and the sharpening is done by workmen while lying flat on their stomachs upon an incline reaching from the floor to the top of the grindstone.

This position was adopted to aid the workman as much as possible in avoiding the breathing in of dust from the wheel. This was particularly important in some departments of cutlery making where the grinding was done dry. In this connection it is recorded that the condition surrounding the grinding of forks at that date were so bad that the average age of the workman was only about forty years.

Probably the most complete bird's-eye view of the workshop toward the end of the 18th Centruy is that furnished by the articles of the "Encyclopedie Methodique." As this was published to show the best methods in use in the various industries of the time, it is only fair to presume that it included about all machines whose practical value had already been proved in France.

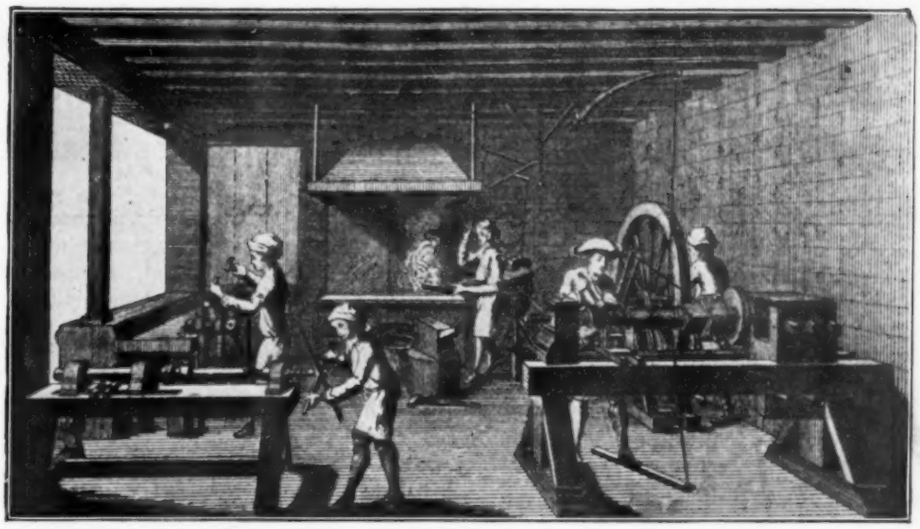


FIG. 53. MAKING VISE SCREWS

Needles were made almost entirely by hand, and so were large nails. The large nails, as in England, were headed by being inserted while hot in a vertical die and the head beaten with a hammer to fit the matrix at the top of the die. Pins and small nails, however, were headed with the foot machines mentioned in the previous article.

There is a splendid picture of a slitting mill for iron, Fig. 50, and still another very important one showing the use of a duplex machine for slitting. Big shears were also employed for cutting thin iron plates. For such heavy products as anchors and anvils, tilt hammers and cranes were employed, but no other important machinery. Where heavy boring was required, we find the use of machines run by water and horsepower. Boring machines of this character are illustrated as being used on cannon, arquebuses and rifles.

Lathes are illustrated in a special article which pictures a lathe for all materials, and another especially for iron. Here also we find the first steps toward a slide rest in devices to hold various tools, as depicted in one engraving showing the turning of iron, Fig. 51, and in another illustrating work on silver plate, Fig. 52. Lathe work is also pictured in the making of metal buttons, and especially in the manufacture of vises where it is employed in cutting the threads of the screws, Fig. 53.

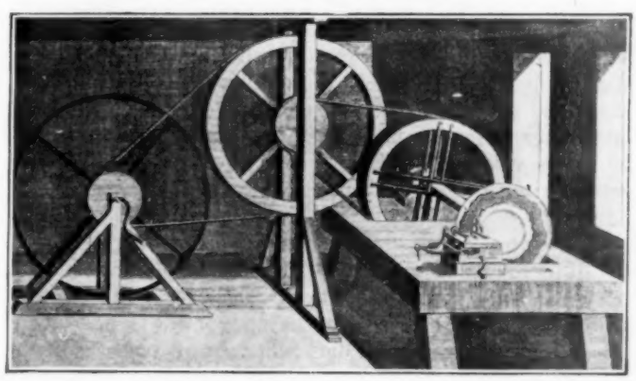


FIG. 52. TURNING A SILVER PLATE OF IRREGULAR OUTLINE. NOTE THE TOOL CONTROLLING ARRANGEMENT

Wire-drawing machines are shown in the article on brass and in the making of iron wire. Here the power was obtained by a waterwheel. The shaft from this had short arms which drew heavy pincers gripping the wire a few inches and then released them. This operation drew the wire, and a workman wound up the slack and saw that the pincers took another grip.

A pressing and punching machine was used on money, and one of a somewhat different type on buttons, buckles and other small articles.

Good examples of grinding and polishing machinery run by water power are shown in the work of polishing, furbishing and sharpening swords and similar weapons. Both shafts and belts were employed, but up to this date the belt seems to have been merely a round rope. The workmen employed at the grinding and polishing stones are, as in a case already noted, lying inclined on their stomachs with their faces practically level with the stone.

It is important to note trades in which machinery seems not to have been introduced as yet. The most important among those where only the simplest hand machines, if any, were employed, were balance making, gold beating, chain making, wheelwrighting, tinsmithing, engraving, spur making, zinc smithing, clock making, horseshoe forging and stove making.

This brings us to what might be called the beginning of the machine-tool era, which started in England at the very end of the 18th Century.

Machining Monel Metal Carbureter Float Points

By Philip S. Dodd

The International Nickel Co., New York

In the article under the above heading on page 629, *American Machinist*, W. H. Addis makes some statements regarding monel metal which are not correct. In the first place, monel metal is a nickel alloy, made up of 67 per cent nickel, 28 per cent copper and 5 per cent other metals. This formula, as the reader will note, is entirely different from the one given by Mr. Addis.

Another thing—far from being soft, monel metal is as strong as mild steel.

Location of Flaws in Rifle-Barrel Steel by Magnetic Analysis

By R. L. SANFORD and WM. B. KOUWENHOVEN
U. S. Bureau of Standards

One of the practical applications of magnetic analysis consists of the detection of flaws in bar stock used in the manufacture of steel products. At the request of the Ordnance Department of the Army and the Winchester Repeating Arms Co., an investigation was undertaken during the war with the end in view of applying this method of magnetic analysis to the testing of rifle-barrel steel.

IN VIEW of the fact that flaws, generally consisting of pipes or slag inclusions, interfere with the drilling of rifle barrels or may possibly affect their strength, it was considered that a nondestructive test which would detect and locate such flaws before further work had been done on the barrels would prove to be of great value. Such a method of inspection would make possible not only the rejection of faulty material, but also the acceptance of all the satisfactory bars in a given shipment and thus effect a great saving both of material and labor. It is the object of this paper to describe the apparatus used in the investigation and to present the results thus far obtained.

The method employed was that of the determination of the degree of magnetic uniformity along the length of the bars, based upon the theory that if a bar is uniform magnetically along its length, it is also uniform mechanically.

A number of barrel forgings were first tested by a point-by-point method originally used for the examination of bars intended for magnetic standards and

FIG. 1. MAGNETIC UNIFORMITY CURVE—PIPED SAMPLE

which has already been described.[1] Fig. 1 shows a specimen curve obtained by this method, and Fig. 2 shows the flaw which was indicated by this curve.

[1]Sanford, The Determination of the Degree of Uniformity of Bars for Magnetic Standards, Bureau of Standards Scientific Papers No. 295.

Since this method is not adapted to the examination of very long bars, and is too time-consuming for a commercial test, it was decided to use a somewhat different method, substantially similar to that used by Burrows[2] for the examination of steel rails. In this method the magnetizing force is applied by means of a solenoid which surrounds the bar and travels along its length. Mounted within this magnetizing solenoid is a test coil by means of which variations in magnetic flux within the bar can be measured. If the bar is magnetically uniform along its length its permeability is constant for a given magnetizing force and the magnetic flux at each point, as the solenoid is moving along, is constant. If this is the case, there will be no electromotive force induced in the test coil as the solenoid travels the length of the bar. If, on the other hand, the permeability is not constant, the flux will vary and a corresponding electromotive force will be induced in the test coil which, if the coils are moved at a constant speed along the bar, is proportional to the change in flux. If, instead of using a single test coil in the manner just described, we use two test coils connected in series opposition we obtain a result that is practically not affected by slight variations in the magnetizing current during a run, as any variations in flux linked with one coil is neutralized by corresponding changes in the other.

FIG. 2. FLAW INDICATED BY CURVE IN FIG. 1

Description of Apparatus and Procedure

Fig. 3 is a photograph of the apparatus as set up at the Bureau of Standards for preliminary experiments before it was taken to the Winchester plant at New Haven for test under factory conditions. The bar to be examined is clamped at the centers of two triangular end plates of cast iron. These end plates are supported by three wrought-iron pipes which also constitute the return circuit for the magnetic flux induced in the test bar.

The magnetizing solenoid, which is shown in more detail in Fig. 4, is supported between the pipes by means of cords running over pulleys and carrying counterweights which hang inside the supporting pipes. One of these cords is continuous and runs over a drum

[2]Burrows, Correlation of the Magnetic and Mechanical Properties of Steel, Bureau of Standards Scientific Papers No. 272, p. 203.

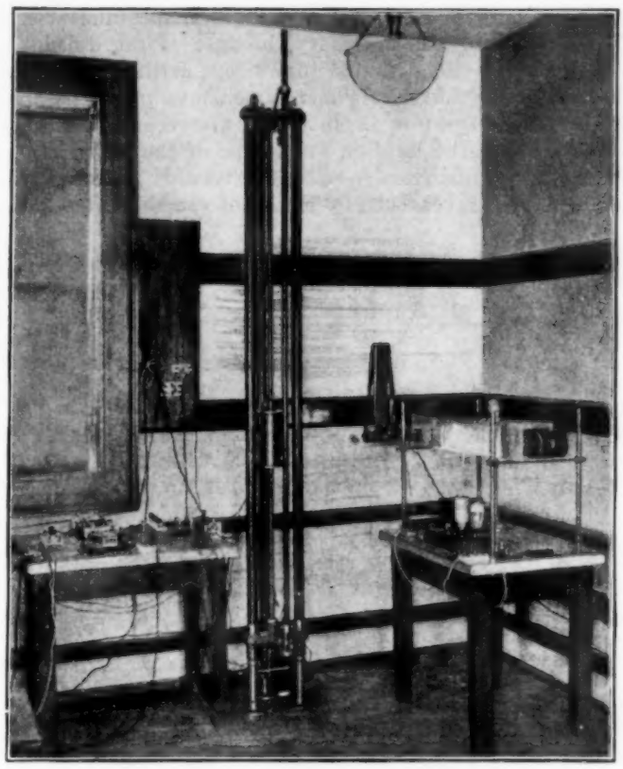


FIG. 3. THE TESTING APPARATUS

mounted on the shaft of a small electric motor. By means of this arrangement the coils can be run up and down along the length of the bar. Magnetizing current is supplied to the solenoid by means of a storage battery and regulated by means of sliding rheostats. The guiding rollers shown in Fig. 4 were later arranged to bear on the test bar instead of on the iron pipes, as it was found that many of the bars were not straight. The test coils are mounted on a separate tube and their position is adjustable. These test coils have 500 turns each, and are connected through suitable resistances to the galvanometer shown at the right of the apparatus.

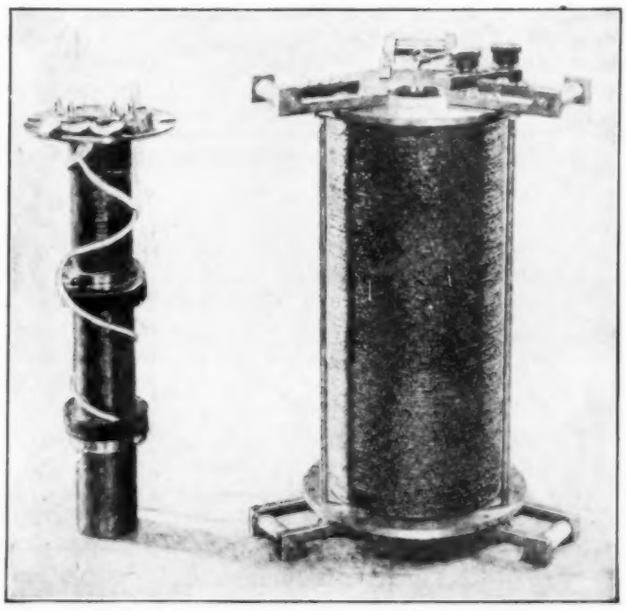


FIG. 4. SOLENOID AND TEST COILS

Deflections of the galvanometer are observed by means of a spot of light reflected from its mirror onto a ground-glass scale. Permanent records of these deflections are made by means of a photographic arrangement which consists of a long light-tight box upon one end of

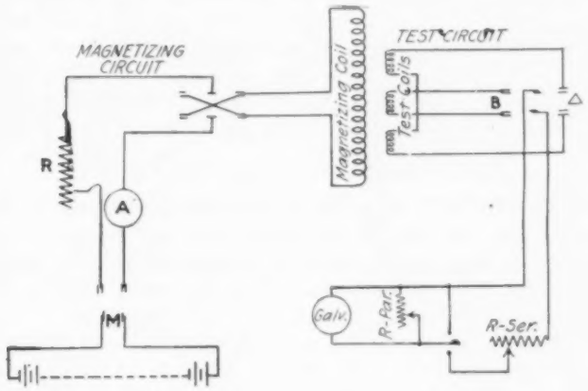


FIG. 5. DIAGRAM OF ELECTRICAL CONNECTIONS

which is mounted an ordinary oscillograph drum which carries the photographic film. This drum is rotated at the proper speed by means of a belt connected to the driving motor of the apparatus. By means of contacts located at one-foot intervals on the driving cord, a light is flashed inside the box which makes a record on the film for each foot of travel, and thus affords a means for locating the position on the bar of any observed non-uniformity. A diagram of the electrical connections is given in Fig. 5.

When a photographic record indicating the magnetic uniformity of a bar is to be made, the procedure is as follows: The bar is clamped in the apparatus, the galvanometer circuit is then closed, and the drum carrying the photographic film is given one complete revolution.

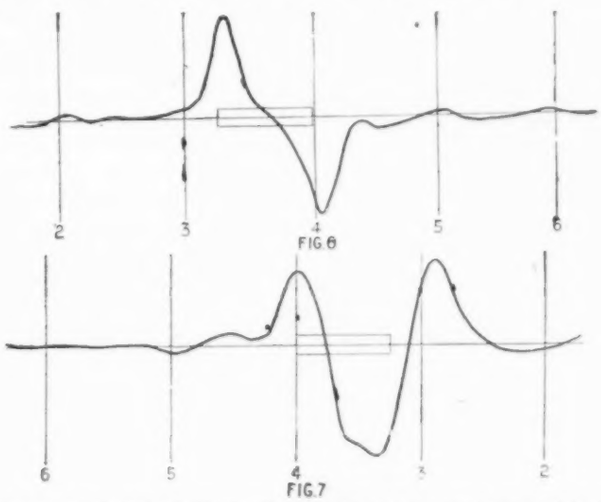


FIG. 6. RECORD WITH SINGLE TEST COIL. FIG. 7. RECORD WITH DIFFERENTIAL TEST COIL

The spot of light reflected from the galvanometer mirror thereby traces a straight line which serves as the reference axis. The switch *M* is then closed and the magnetizing current is adjusted to the proper value by means of the regulating rheostat *R*. With the galvanometer connected either to the single test coil or the differential coils as desired, the driving motor is then started and the coil is run the length of the specimen

with the film holder rotating at a uniform speed. Most of the records have been made by running the coils in one direction with the galvanometer connected to the single test coil, and in the other direction with the galvanometer connected to the differential coils. Fig. 6 shows a record taken by the use of the single coil, and Fig. 7 shows the corresponding record taken with the differential coils. A rectangle is drawn on each of these records to show the position and extent of a strip of transformer iron which was attached to the bar in order to give the effect of a flaw.

Preliminary Study and Adjustment

After the apparatus was completed and set up in the laboratory, it was necessary to consider a number of points in connection with its operation and to decide upon the proper adjustment of the test coils. The points to be considered included the proper flux density B in the specimen, the proper speed for the moving coils, the period of the galvanometer and, as just mentioned, the best location of the test coils. As a result of observations taken under a great variety of conditions, it was found that a flux density of approximately 15,000 gausses gives the best results. The speed of travel finally adopted was approximately one-half foot per second. It is necessary in order to insure that the record

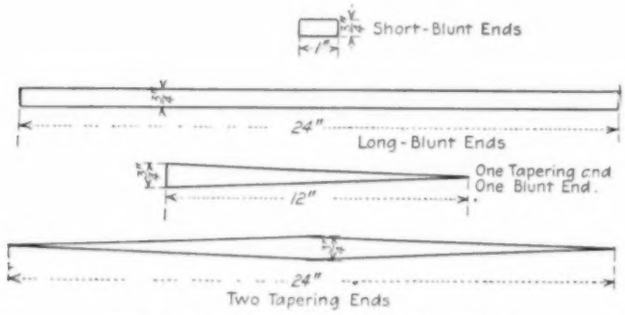


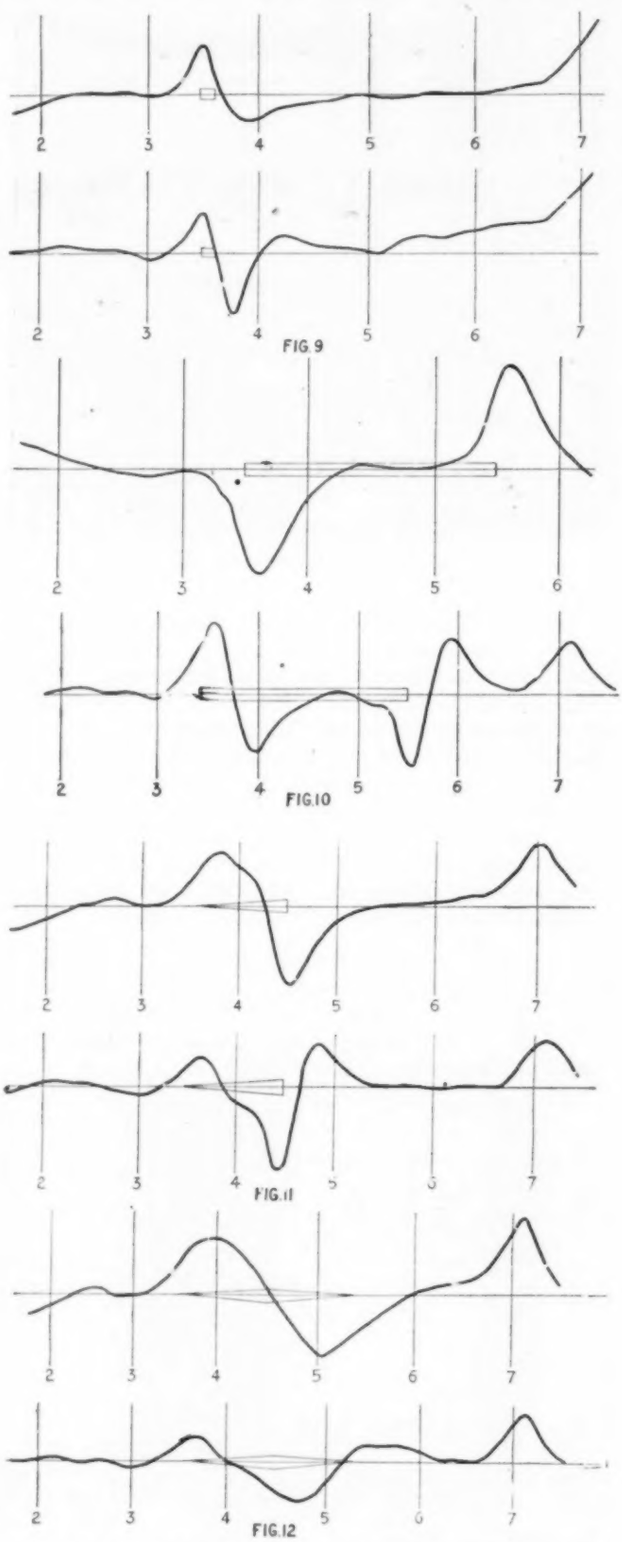
FIG. 8. DIMENSIONS OF ADDED STRIPS

gives a true indication of the condition of the specimens that the galvanometer have a fairly short period. If the period is too long, the galvanometer does not follow closely the changes in the induced electromotive force. A period of approximately one second was found to be satisfactory. The photograph of the test coils shows only two coils in position. For convenience, however, a third coil was made, and the differential coils were located 10 cm. apart and equidistant from the single coil which was located at the middle of the magnetizing solenoid. With this symmetrical arrangement, records could be duplicated by running the coils in either direction.

Preliminary Exploration Made

A preliminary exploration to determine the flux distribution along the specimen for different positions of the magnetizing solenoid was made by a point-by-point method, using the single test coil connected to a ballistic galvanometer. Readings were taken upon reversal of the magnetizing current. The result of this exploration showed that, for a given magnetizing current, the flux is constant at different points along a uniform bar except for the regions very near the ends.

In order to study the effect of flaws varying in extent and kind, a number of records were made on a bar previously found to be uniform, to which were attached strips of transformer steel of various shapes and sizes. This procedure was necessary, because of the difficulty of producing longitudinal flaws by artificial means. Fig. 8 shows the shapes and dimensions of the strips thus used. Figs. 9 to 12, inclusive, are records obtained in this way. The location and shape of the added strip is indicated in each case upon the record. The figures show records taken both by means of the single test coil



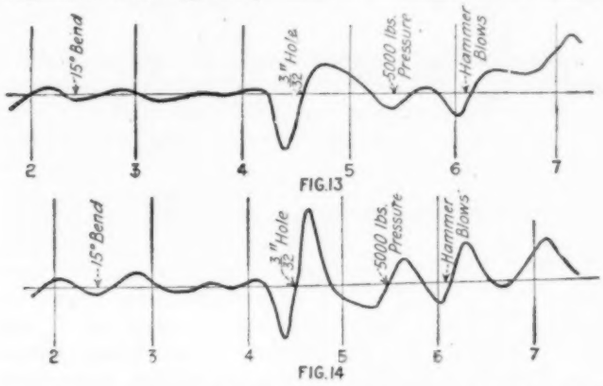
FIGS. 9 TO 12. RECORDS OBTAINED FROM ADDED STRIPS OF VARIOUS SHAPES AND SIZES

and by means of the differential coils. Figs. 13 and 14 show the effect of various treatments on a bar originally uniform. The treatments given, and the locations, are indicated in the figures. It was at first feared that, due to the sensitiveness of the method, spurious indications would be obtained for bars which had been slightly bent during shipment and handling at the factory. The result of this last test, however, indicates that such is not the case.

After the preliminary experiments just described, the apparatus was shipped to the plant of the Winchester Repeating Arms Co., at New Haven, and there set up for final trial.

Experimental Results

The greatest difficulty in this line of investigation lies in the interpretation of the results. This is due to the fact that there are many causes which may produce magnetic inhomogeneity and it is difficult to differ-



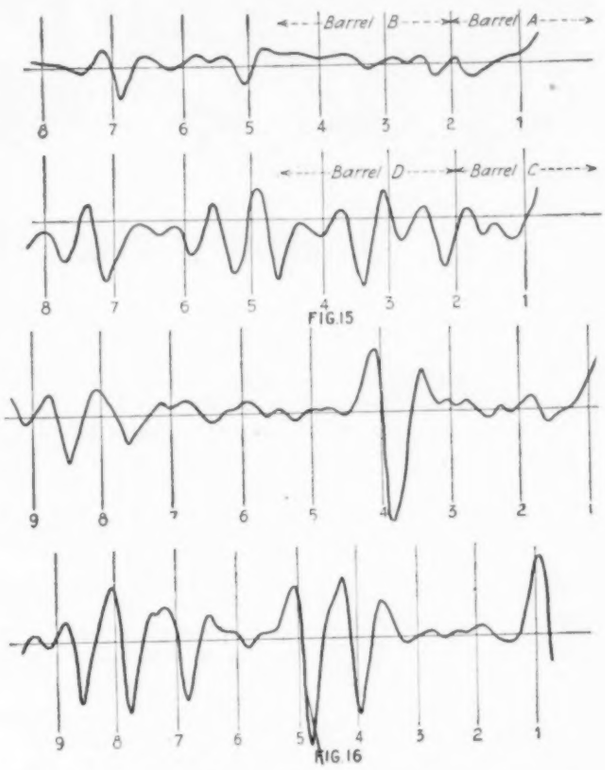
FIGS. 13 AND 14. EFFECT OF VARIOUS TREATMENTS ON A BAR THAT WAS ORIGINALLY UNIFORM

entiate between them. The work at New Haven was done with the end in view of obtaining data which would establish the amount of variation and the type of curve which accompanies a pipe. The procedure was to make records of bars which in a preliminary test showed large variations. These bars were chosen from lots of steel which had previously been rejected as the result of tests in the drilling shop. It is an interesting fact that even though this lot of steel had previously been rejected on account of pipes, not a single pipe was discovered in the drilling tests on samples for which records of the magnetic uniformity had been obtained. This is true of all the steel examined up to Mar. 31, 1919.

Records of Magnetic Homogeneity

Figs. 15 and 16 show records of the degree of magnetic homogeneity of four bars of steel. These records were made with the differential test coils and with a fairly low sensitivity of the galvanometer. The portions of these bars from which barrel lengths were cut are indicated in the figure. Barrels *A*, *B*, *C*, and *D*, cut from bars *1* and *9* and those cut from the entire length of bars *2* and *4* were sent to the shop for drilling tests. Barrels *B* and *D* gave trouble in drilling and each destroyed the edge of a drill, thus necessitating the use of a new drill to finish the bore. None of the other barrels gave trouble and the inside surfaces of all were smooth and bright. In view of the fact that additional data is necessary in order to draw satisfactory conclusions, the Winchester Repeating Arms Co. is continuing the investigation.

This paper describes an investigation which was undertaken for the purpose of determining whether an application of magnetic analysis was practicable for the detection of flaws in rifle-barrel steel. By means of apparatus especially constructed for the purpose a large number of bars were explored for magnetic uniformity along their length. In spite of the fact that these bars



FIGS. 15 AND 16. RECORDS OF THE DEGREE OF MAGNETIC HOMOGENEITY OF FOUR BARS OF STEEL

were taken from material which had previously been rejected as the result of drilling tests, not one was found which contained a pipe. The results obtained, however, demonstrated that the method is amply sensitive to detect and locate flaws. Further study is necessary to determine to what degree the sensitivity of the apparatus should be reduced in order not to cause the rejection of material which is satisfactory for all practical purposes, and also to determine the type and magnitude of the effect which will be produced by a pipe. For this reason the work is being continued by the Winchester Repeating Arms Co., who co-operated in the investigation and at whose plant the apparatus has been installed.

The authors wish to take this opportunity to acknowledge their indebtedness to J. S. Gravely, M. F. Fischer, and J. S. Becker for their valuable assistance in carrying out this investigation.

There was a station mechanic who could not understand why a man younger in the service was made foreman instead of him. One day the foreman left an outline of some work for the mechanic to do. In too literally following instructions, the mechanic burnt out some valuable equipment and shut the plant down. Taken to task, he exclaimed: "I didn't make the 'bull,' he did it! *I only did what he told me to.*" Still the mechanic wonders why he was not made foreman.—*Power.*

Putting the Motor Together

By FRED H. COLVIN
Editor, *American Machinist*

THE assembling methods described in this article are used by the Chandler Motor Car Co., Cleveland, Ohio, and are of interest in showing some of those which have been found satisfactory and economical in the production program. Figs. 1 and 2 show two of the sub-assemblies, the first being the bolting of the connecting rods to the crankshaft, and the second, the studding of the crankcase. Fig. 1 shows the curved cheeks of the crankshaft and the spacing of the crankpins. The three cranks and connecting rods are separated into groups, indicating that the cylinders are cast in two blocks of three, as shown in Fig. 4.

The methods used in assembling a motor, just as those used in machining the parts, depend to a large extent upon the amount of the production required. Modern methods, however, demand that practically no hand-fitting takes place in the assembling department, even with small production.

The flywheel end of the crankshaft is held in a bench vise, while the outer end is supported on a stand, as can be seen. The rods are then attached to the crankpins and tested to determine whether the fit is of the kind desired. Removing or replacing shims enables the assembler to secure the correct fit.

In the meantime, the crankcases, which are in another department, are being studded for the main bearings, four studs being used for each bearing. These crankcases are mounted on very simple trucks or carriers as can be seen in Fig. 2. The trucks run in a channel or track which is at the proper height to bring the cases at a convenient height for the workmen. These cases move along from one position to another, finally going to the motor-assembly department after they are completely studded and inspected.

After the connecting rods are assembled on the crankshaft, the whole sub-assembly is placed in a specially constructed oil tank, which is arranged so that the crankshaft can be driven while the connecting rods are held in a vertical position. This is simply the Chandler method of running the connecting-rod bearings in, and seems to work out very satisfactorily. After running in for a specified time, the crankshafts are assembled

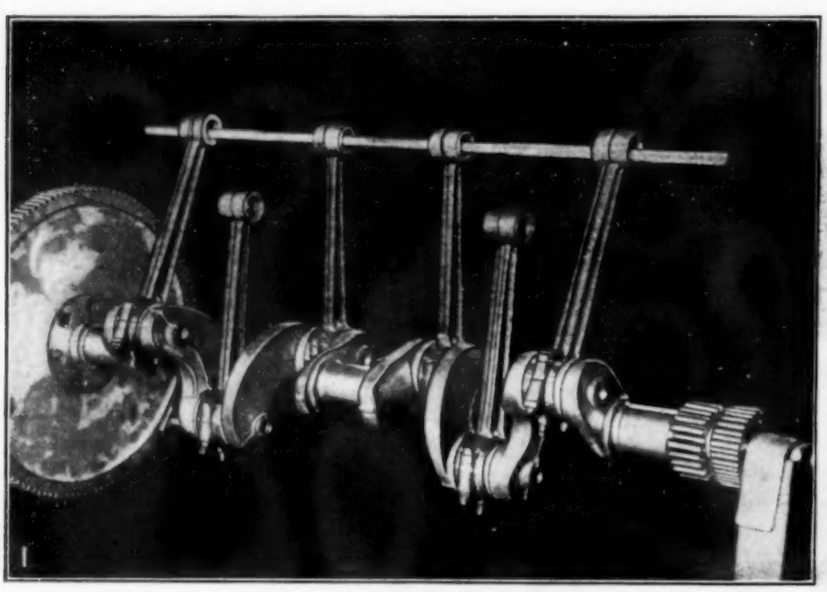


FIG. 1. CRANKSHAFT ASSEMBLY

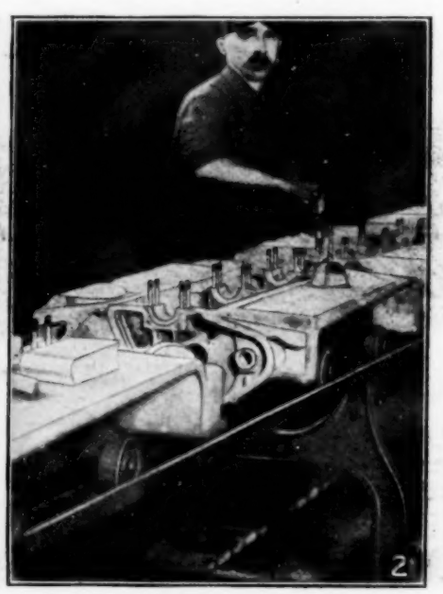


FIG. 2. STUDDING CRANKCASE

AUTOMOTIVE CONSTRUCTION

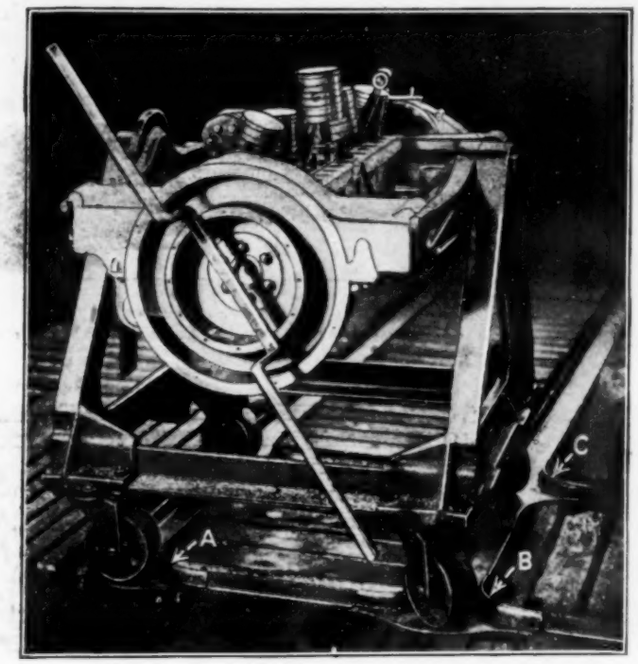


FIG. 3. ASSEMBLING STAND AND TRACK

in the crankcase as shown in Fig. 3, and the pistons put in place. This part of the assembly has not been completed, as one of the rods can be seen without a piston.

Assembling Stand and Track

This view also gives a good idea of the assembling stand with its swiveling frame and its large casters, and also the track in which the casters run. The base of the truck is square and the casters are equidistant from one another. This enables the truck to be readily shifted from one direction to the other by means of the special curved corner plates in the track, shown at *A*, *B* and *C*. In this case, the truck has just been moved to its present position from the track shown on the right, and, by pushing in the other direction, the casters easily swivel and enable the truck to be moved down the other track. This arrangement obviates the necessity of employing turntables, which are not only much more expensive to install but are also more or less of a nuisance in several ways.

Clamps for Holding Piston Rings In

After the crankshaft, connecting rods and pistons are in place, the camshaft, water pump and magneto are assembled, as shown in Fig. 4. This also shows how the cylinder blocks, of three cylinders each, are put in place. With crankshaft so turned that the pistons come in the position shown, the clamps *A* are placed around the piston rings and tightened sufficiently to close the rings to the cylinder diameter. These clamps are not screwed up so tightly, however, as to prevent their being easily pushed out of the way by the cylinder block as it is lowered into place. As soon as all the rings are entered in the cylinder bore, the clamps are removed by simply loosening the bolts and swinging them out of the way so that the cylinders can be lowered into place. The cylinder blocks are not so heavy as to be difficult to handle, and, as can be seen in the illustration, one man is lowering a block over the pistons.

The Final Assembling Operation

The final assembling operation is to face the end of the crankcase square with the crankshaft, so that the transmission unit may be in line with it when the clutch and transmission are assembled. To do this the crankshaft is driven from the front end by the special electric motor reduction-drive *A*, Fig. 5, while the facing head *B* is bolted to the flywheel in place of the clutch unit.

This head carries a special facing tool at *C*, this being controlled by the star feed wheel at *D*, and is fed out as the crankshaft is revolved, comparatively slow by the reduction drive *A*. The stationary or feeding pin *E* is attached to the arm *F*, the end of which rests on the floor to prevent it turning. This gives a positive method of securing a square face on the end of the crankcase. This figure also gives a good view of the assembling stand.

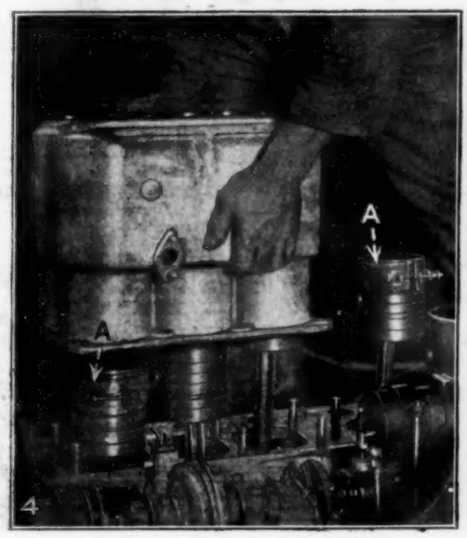


FIG. 4. PUTTING ON CYLINDERS

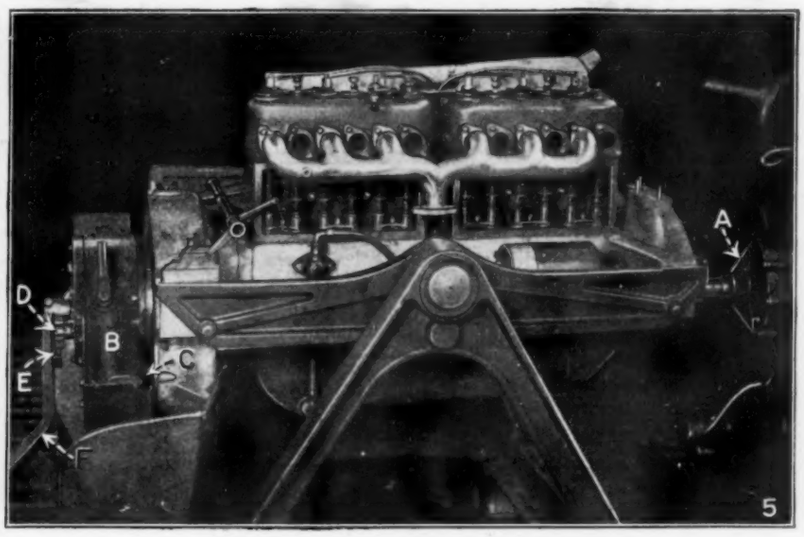


FIG. 5. FACING END OF CRANKCASE

Micrometer Attachment for Calipers

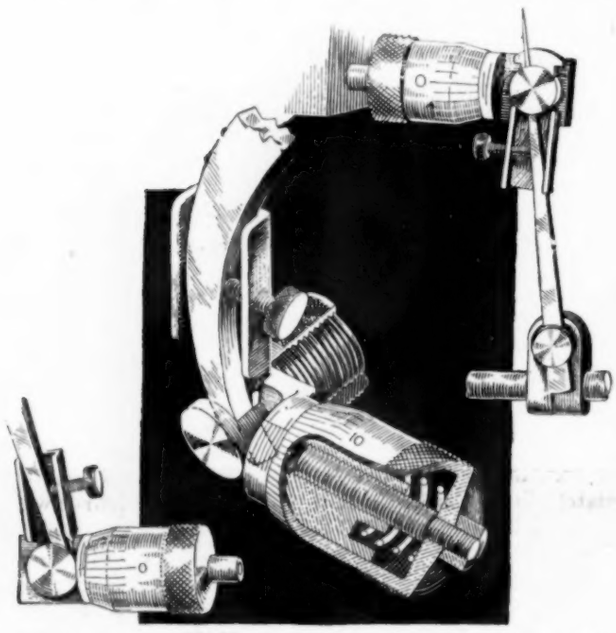
By N. Renwick
Sydney, Australia

I have used the attachment shown in Fig. 1 for some time and have found it useful both on calipers and in the lathe. It can be used for fine adjustment on outside, inside, or hermaphrodite calipers; it can also be attached to a depth gage, or used on a scribing block as a height gage.

For setting a taper in the lathe it may be attached to a piece of drill rod held in the toolpost. A plug gage or something with the correct taper is held between the centers, and the crossfeed moved forward until the end of the spindle is about ½ in. from the surface at the small end of the gage. The thimble is then turned into contact and the reading taken. The thimble (not the crossfeed) is then screwed back and the carriage moved up to the large end, where the reading is taken. If both readings are the same, the taper is correct, but if the taper reads larger at one end, that end should be moved slightly away from the operator.

One slight inconvenience is that if the marking is set to read rightly for outside calipers (which is best) it reads the wrong way for inside. This may be overcome by double marking, but I find it quite convenient without this.

Details of construction are shown in Fig. 2.

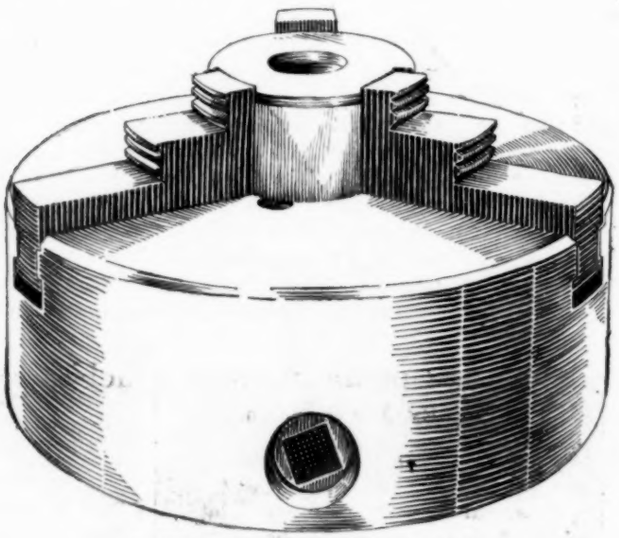


FIGS. 1 AND 2. A MICROMETER ATTACHMENT FOR CALIPERS, SHOWING DETAILS OF CONSTRUCTTION

Lathe Chuck as Work Holder on Drilling Machine

By H. H. Parker

An old universal lathe chuck of 6 in. or more in diameter, with the flange removed from the back to give a flat bearing surface, will be found convenient to hold washers, stub shafts, bolts and other small pieces of work for end drilling in the drill press. The chuck rests vertically on the table and may or may not be clamped down, depending upon the size and character of the work.



LATHE CHUCK TO HOLD WORK FOR DRILLING

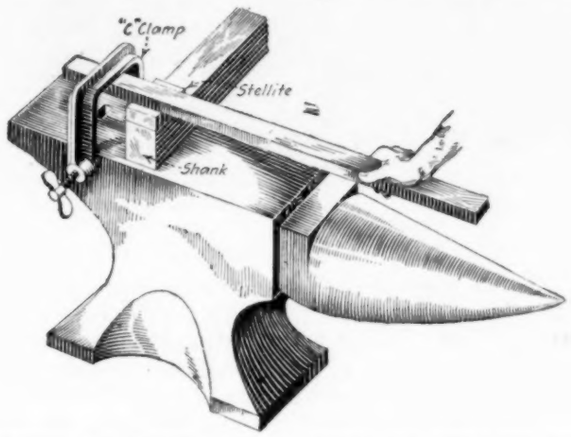
Washers or small thin disks are difficult pieces to handle for drilling, but by using a hardwood cylinder of about the same diameter as the washer as a packing piece in the chuck, this trouble will be obviated.

The wood packing is slipped into the chuck, the washer rested upon it, and the jaws tightened; the piece will then be held securely for drilling without danger of canting and loosening.

Welding Stellite to Carbon Steel

By Fred B. Corey

On page 295 of the *American Machinist*, Mr. Kronfeld calls attention to a most excellent method of welding stellite to carbon steel by means of Tip-It welding compound. This process has been in use for some time and produces results that leave little to be desired. The



IMPROVISED PRESS FOR WELDING ON STELLITE TIPS

making of perfect welds in the ordinary blacksmith forge is a matter of the utmost simplicity when this flux is employed.

To secure the pressure necessary to complete the weld, Mr. Kronfeld suggests the use of "a small air press, an arbor press, a screw press or a vise turned up vertically." While these are all excellent for the purpose, they are not always found in close proximity to the forge fire.

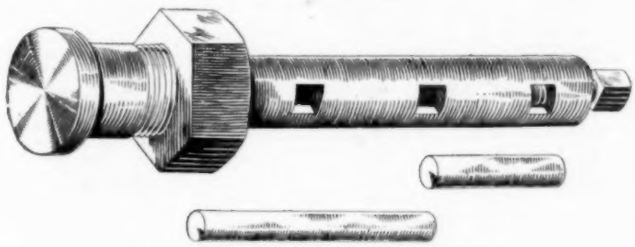
The accompanying sketch shows a very simple arrangement that is used in a number of shops with the greatest satisfaction. The C-clamp is quickly attached to the anvil and its height adjusted to secure an even vertical pressure on the tool to be welded. After bringing the two parts of the tool to the proper heat, they are simply pressed together by means of the bar, as shown. The pressure is required for a few seconds only and is absolutely under control of the operator.

A Tool Bar for the Shaping Machine

By John J. Burke

The accompanying sketch illustrates a tool bar for a shaping machine which is convenient for many special jobs. The bar has three square slots and a hole is drilled through the center to the last slot.

Two pins are provided as an extension from the setscrew to the different slots to hold tools firmly in position.



TOOL BAR FOR SHAPING MACHINE

An Offset Boring Head

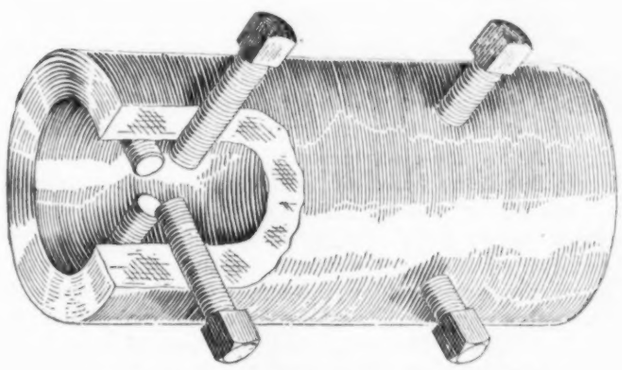
By Charles D. Folsom, Jr.

In boring holes on the milling machine or horizontal boring mill, the task of setting a cutter to bore to micrometer size is so slow and difficult that a great many devices for making it easier have been put on the market. These offset boring heads, as they are called, provide an accurate adjustment for the tool, and so eliminate the cut-and-try time to a large extent.

Although they do the work well, they are all too expensive and cumbersome for the average mechanic to include in his kit; and, I might add, they are apparently too expensive for most small shops to include in the tool crib.

I have seen several designs for home-made boring heads in the *American Machinist*, but although my foreman and I are on good terms, I should hesitate to mill out dovetail slides and turn little lead screws for myself on the company's time, as some writers suggest in making their boring devices.

However, I have a little boring head which I made



AN EASILY MADE BORING TOOLHOLDER

in about an hour. I took a piece of 1-in. round stock about 3 in. long, put it in the lathe and ran an $\frac{13}{32}$-in. drill through it. Then I drilled and tapped eight holes as shown in the sketch for $\frac{1}{4}$-in. setscrews. Then I got the screws and put them in place, and the job was done.

In use, this head is placed in the chuck and a boring bar (forged drill rod may be used conveniently) is inserted in it. The bar may then be trued up approximately by adjusting the setscrews as in a four-jawed chuck; and then, by further adjustment, any desired cut may be taken. The point of the tool should be in line with two setscrews.

A very sensitive and satisfactory adjustment may be made by slightly tightening or loosening the proper screws. Although this does not allow of "micrometer" adjustment, it is positive and certain in its action. And it is this definite adjustment, rather than a reading in thousandths, which makes such a device valuable.

Removing Broken Taps

K. L. Unland

On page 795, vol. 51 of the *American Machinist*, I note a description of a method of removing broken taps by means of the oxy-acetylene process. The method described would probably be comparatively simple provided the tap broke in such a way as to leave an exten-

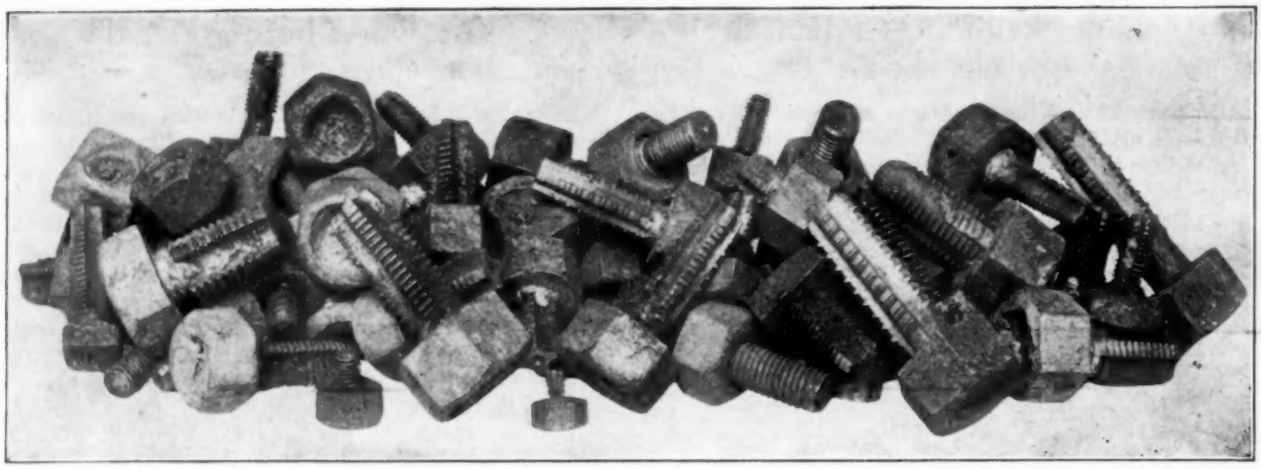


FIG. 1. BROKEN TAPS REMOVED BY ARC WELDING

sion outside the casting. However, in case the tap broke from ¼ to ½ in. below the surface, it would be very difficult to make the weld strong enough to withdraw the tap and at the same time avoid welding the tap to the sides of the hole, or burning the welding tip.

Fig. 1 shows a pile of taps which have been removed, illustrating the great variety in sizes and types; while Fig. 2 shows two taps, the larger one of which was broken off ¾ in. down in the hole. These taps were all removed by the electric arc welding process using the metallic electrode method. The procedure is as follows:

The arc is struck on the top of the tap and is kept there, building up metal until the surface of the casting is reached. An ordinary machine nut is then laid over the hole and the welding continued until the deposited metal builds up inside of the nut, when it is welded fast to the nut. After cooling, the tap is removed by the use of a wrench. Very few cases are found where this procedure fails to remove the tap. Occasionally a tap splinters, but even in such a case the weld joins the parts so they all come out properly.

The vital point in doing such a job is to keep the arc from striking the side of the hole. Where the arc is kept on the bottom the metal is welded to the bottom and merely runs against the sides, but does not adhere. In some cases a thin sheet of copper or brass is bent to fit inside the hole to protect the threads and prevent welding to the sides of the hole.

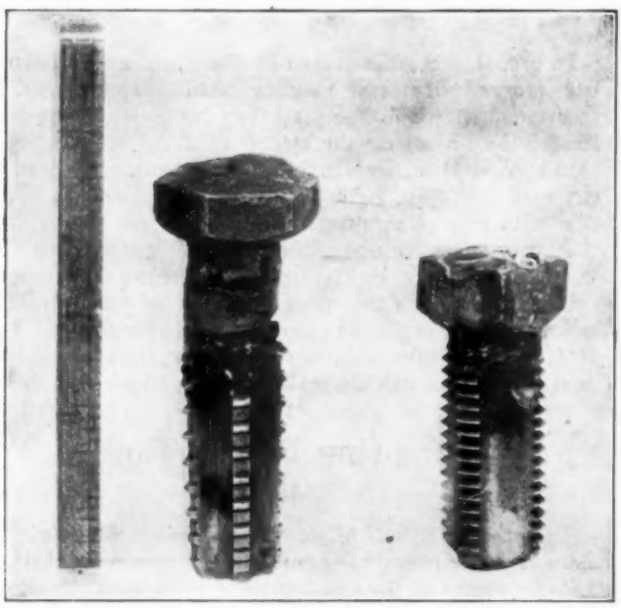


FIG. 2. THE MANNER IN WHICH THE REMOVAL IS ACCOMPLISHED

Where Safety First Paid

By Winfield W. Blakeman
Superintendent, Blanchard Machine Co.

The illustration shows an unusual accident that might have resulted seriously except for the precautionary banding of the cupwheel with wire, as shown. This wheel was grinding a number of double-edge cutter blades about 2 x 3 in. and ⅜ in. thick, as shown beside the wheel. In some unaccountable way one of these blades was picked up by the wheel during the grinding operation, and driven with such force that it penetrated the wheel from the inside, as shown in the illustration.

The wire banding not only prevented the operator from being injured but enabled him to continue his work until the job was finished and the machine stopped. He missed the cutter but thought it must have dropped off into the pan, and did not discover the broken wheel until he removed the guards.

HOW BANDING A GRINDING WHEEL RESULTED IN SAFETY

Safe Storage of Patterns

By J. V. HUNTER
Western Editor, *American Machinist*

When a manufacturer has been in business for many years and has found it necessary to make changes in the design of his product from time to time, the collection of patterns that will accumulate is generally very large. While apparently obsolete, such patterns must be kept for many years so that repair parts can be furnished for machines yet in use.

THE scrapping of obsolete patterns of agricultural implements is risky even when it is deemed that repair parts will no longer be called for, because some farmers who take good care of their implements are apt to send for repair parts after a lapse of years. Failure to supply such parts will lose the manufacturer the good will of the farmer who wants the repair parts, and the good will of the farmer is an asset that no manufacturer of agricultural implements can afford to ignore. Such has been the experience of the Minneapolis Threshing Machine Co., West Minneapolis, Minn., which has lately built a fireproof pattern-storage building to house what is conservatively estimated to be one million dollars worth of patterns.

The building, which is three stories high, is constructed of concrete and brick and has steel sash glazed with lights of wire-reinforced glass. A complete sprinkler system has been installed and all openings to the elevators and stairways are guarded by double fire-doors.

Provision has been made for adding another story and with this in view the roof was made flat so as to be utilized for the fourth floor. The pitch for shedding rain water was added by a cinder-concrete covering graded high in the center and covered with roofing material. This can be readily removed in case the additional story is added.

A general idea of the character of patterns stored may be obtained from the view of a portion of the storage space, Fig. 1, which shows patterns ranging from large gear wheels to some of the smallest used. The value of one of these gear patterns, together with its molding machine stripper plate, is in the neighborhood of $1,000.

A portion of the shelving, Fig. 2, shows its general character. The vertical columns are of 2-in. pipe.

A close view of the shelf bracket, Fig. 3, shows the manner in which it is fitted around the vertical pipe, and clamped in place by bolts which pass through the two parts. This bracket is also used as one of a pair for the intermediate supports at the ends of the sections.

The horizontal members across the ends of the sections are of piping but the transverse members are made of 1½ x 2-in. angle irons, notched to pass over the cross-piping and riveted to brackets which clamp down to the main bracket *A*, Fig. 3. These transverse angles are placed 12-in. apart and across them at intervals of

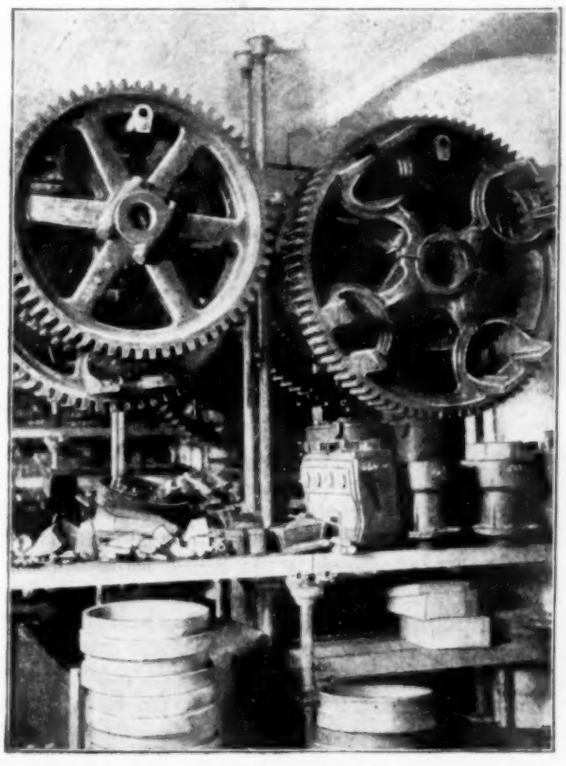


FIG. 1. COMBINATION OF BRACKETS AND SHELVES FOR CARRYING PATTERNS

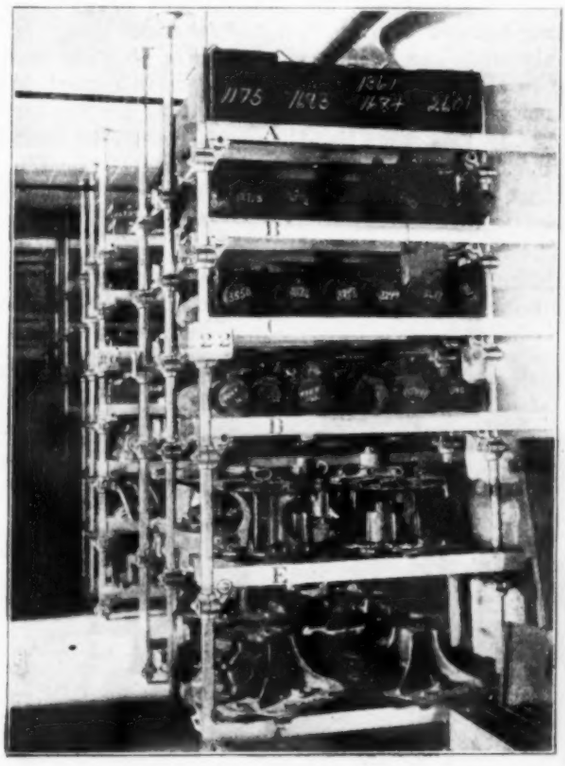


FIG. 2. AISLE SHOWING TIERS OF SHELVING

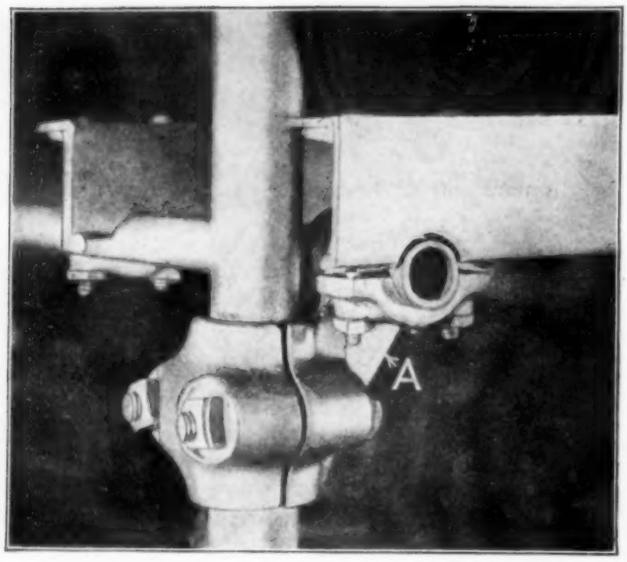


FIG. 3. BRACKET USED FOR SHELF SUPPORT

12 in. are strips of ¼ x 1-in. flat bars, lightly riveted to the angles, thus forming a sort of lattice which prevents the large patterns from falling.

To prevent small patterns from falling through, the shelves are covered where necessary by screen of ½-in. heavy wire mesh laid across the lattice-like shelving and bent over the angle iron at the ends to prevent it from sliding out of place. It may also be bent up on the sides to form a vertical partition separating one section from the next. This open shelving has decided advantages because the dust and sand which fall from the patterns cannot lie on the shelf, but drops through and eventually reaches the floor where it may be swept away.

The tiers of shelving are numbered, and the designating number is placed on a sheet-metal plate located on the aisle corner of each tier, Fig. 2. The shelves are further designated by letters, which start in sequence with A for the top shelf, to F for the bottom shelf. In this same tier the shelf sections to the right of the concrete column will start with G for the top shelf in the next division, and so continue for all divisions.

This method permits the division of a large amount of shelving into a very large number of index spaces which can be readily identified by the pattern-storage keeper.

FIG. 4. STORAGE OF MOLDING EQUIPMENT IN BASEMENT

This man, on placing a pattern on any particular shelf, makes a record of the section and letter number in his book, and when this pattern is wanted again, reference to the book will quickly show in which one of several hundred sections it may be found.

Some shops make a point of trying to keep patterns stored in accordance with the sequence of shop numbers, but when thus placed on a shelf, the result is often the loss of much dead space in one section, together with overcrowding in an adjoining section.

Such patterns as large gear wheels that may be hung up are suspended from pipe brackets that extend from the side of the shelving, Fig. 1, each one bearing a number plate which identifies that bracket for reference in the pattern-storage record. These brackets will carry several gear patterns with no danger of damage. All patterns are stored on the two upper floors while the basement floor is devoted to other appliances of the foundry. This refers to match plates, mold boards and special flasks which are used for the molding of special work. A typical corner of this floor, illustrating the general character of the appliances stored, is shown in Fig. 4. They are usually of heavy character, and for convenience are handled by means of a trolley hoist, so that all bays of the floor are provided with an overhead I-beam trolley rail upon which are carried chain hoists for picking up and removing any of the heavier pieces.

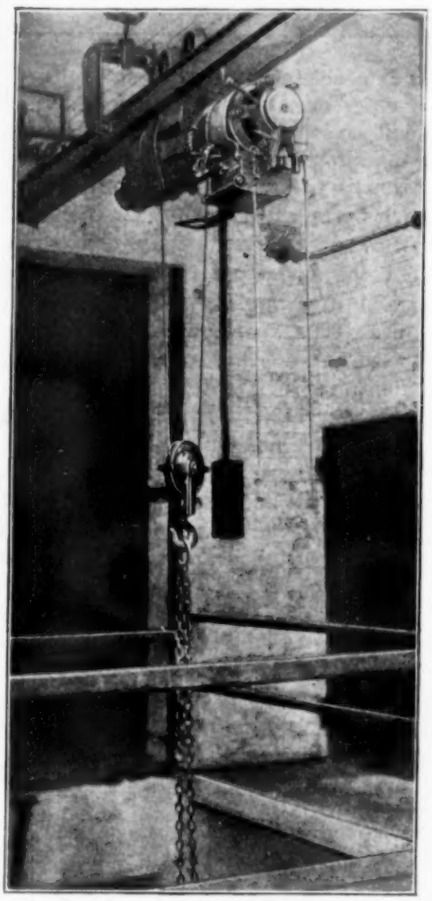


FIG. 5. ELECTRIC FOUNDRY HOIST CONVEYING TO ELEVATOR SHAFT

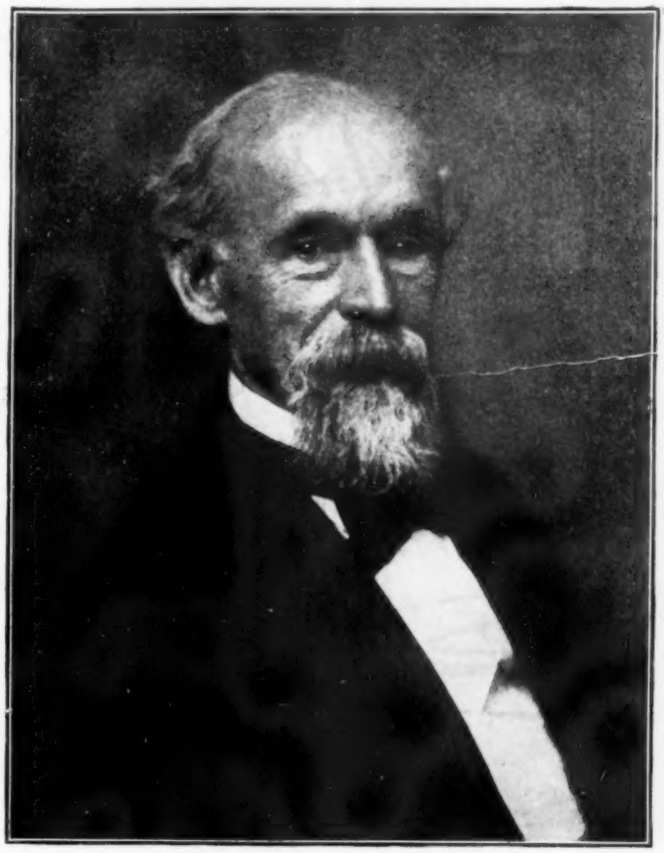
The foundry is located across an open areaway from the pattern storehouse and the double-rail electric trolley hoist, Fig. 5, conveys the heavy mold boards and flasks, which it picks up from the molding floors and lowers through the elevator shaft to the basement floor of the pattern storehouse. All openings into this shaft are thoroughly protected by firedoors. An additional purpose which this building now serves is for the storage of molders' tools that are furnished by the foundry, such as shovels, riddles, etc., and from here they can be served out as required by the storekeeper.

Dr. John A. Brashear

Dr. John A. Brashear, scientist-physicist-astronomer, died at his home in Pittsburgh, Pa., on April 8.

Dr. Brashear was born in Brownville, Pa., in 1840 and was educated in the public schools. He learned the machinist's trade and from 1860 to 1880 worked in the rolling mills of Pittsburgh.

As a boy he had caught a glimpse of the Heavens through a telescope and his ambitions to study astronomy were aroused. Being too poor to buy a telescope he and his wife set out to make one. In their little home, built with their own hands, they set up a shop having a small steam engine and a lathe, and here made the tubes and ground the lenses for a 5-in. telescope that took them three years to construct. Spurred on by what they saw through this little instrument they commenced to build a 12-in. telescope only to have the objective lens break after two years had been spent grinding and correcting it. Here the grit and perseverence of the man and his loyal wife were shown, for when he came home from the next day's work at the mill he found all preparations made for beginning work on a new lens. This lens was successfully brought to completion. In 1876 Dr. Brashear attracted the attention of the late Professor Langley, at that time head of the Allegheny Observatory, and after two years' work in a small shop he had established on the South Side of Pittsburgh, he was enabled through the assistance of one of the observatory patrons to establish works in Allegheny for the manufacture of astronomical instruments.



DR. JOHN A. BRASHEAR.

Perhaps his most important achievement has been in connection with the design and development of the spectroscope for astronomical uses, particularly with reference to the accurate optical and mechanical features. In 1888 he completed the spectroscope for the 36-in. telescope of the Lick Observatory, furnishing the optical and mechanical parts. The excellent results of the work done at the Lick Observatory has been freely attributed by Professor Keller to Dr. Brashear's skill and genius. Many of the spectroscopes in the principal observatories of the world are products of the Brashear workshop as are many of the largest telescopes and objectives for astronomical research.

Dr. Brashear's more purely scientific work also brought recognition and at about the time he established the Allegheny shop he was given an appointment in the University of Western Pennsylvania, of which the Allegheny Observatory was a department. From 1898 to 1900 he was acting director of the observatory and has raised $300,000 for the building and equipment of a new observatory in Riverview Park. He has always kept in close touch with this observatory and through his efforts one department has been put at the disposal of the public.

For twenty years Dr. Brashear was a trustee of the Carnegie Institute, for fifteen years of the Carnegie Institute of Technology and for twenty years of the University of Pittsburgh. In the latter institution he served also as Chancellor and it is said that he did more for the cause of education in Pittsburgh than any other three men. Several years ago a friend placed in his hands an endowment fund of $250,000 to be used for the advancement of teachers and teaching in the public schools and as a result over seven hundred teachers have been sent to different parts of the country for rest and study, bringing back new ideas and great enthusiasm. Dr. Brashear became a member of the American Society of Mechanical Engineers in 1891, was made a manager in 1899, and an honorary member in 1908. In 1911 he served as one of the representatives on the John Fritz Medal Board. During 1915 he was president of the Society. He was a Fellow of the American Association for the Advancement of Science; of the Royal Astronomical Society of Great Britain; past president of the Engineers Society of Western Pennsylvania, and the Pittsburgh Academy of Arts and Sciences; a member of the British Astronomical Association, the Société Astronomique de France, the Société de Belgique, the American Philosophical Society, the Astrophysical Society of America, the Washington Academy of Sciences, the National Geographic Society, and an honorary member of the Royal Astronomical Society of Canada.

Washington and Jefferson College, Wooster University and the University of Pittsburgh have each conferred upon him the degree of LL.D.; Princeton University and the Western University of Pennsylvania the degree of Sc.D. and Stevens Institute of Technology the degree of Doctor of Engineering.

Dr. Brashear was the kindliest of men and ever ready to assist others. No one ever appealed to him for help without avail. Truly it may be said of him that he was "Of the salt of the earth."

Long ago he and his wife agreed upon the following epitaph to be placed in their tomb: "We have loved the stars too fondly to be fearful of the night."

THE WATCH DOG OF INDUSTRY
ENTRANCE TO AMEDICAN INDUSTRY
ERICAN USTRY
AMERICAN INSTITUTE OF WEIGHTS AND MEASURES
WORLD TRADE CLUB
COMPULSORY METRIC BOMB
This Bolshevik won't get in if you keep the dog in good condition.
AMERICAN MACHINIST
Breul

A Watch Dog of American Industry

NO sane man acquainted with present manufacturing conditions can fail to see the enormous confusion and added burden to already overloaded industry that the enactment of a *compulsory* metric law would cause.

The pernicious activities and influence of the World Trade "Club" with its millionaire "angel" to pay its bills, must be counteracted by telling the TRUTH.

The busy executive has no time to spare from his exacting business duties and only sees the danger confronting him in the possible passage of a compulsory metric law when his attention is jarringly called to it by the Klaxons of his favorite papers, or of some organization especially constituted to watch over his interests in things of this character.

Such an organization exists in the American Institute of Weights and Measures, 115 Broadway, New York City.

This Institute was formed to combat all metric legislation or propaganda tending to upset our present system of measurement. The men connected with it are live, able business men who *know* manufacturing and industrial conditions.

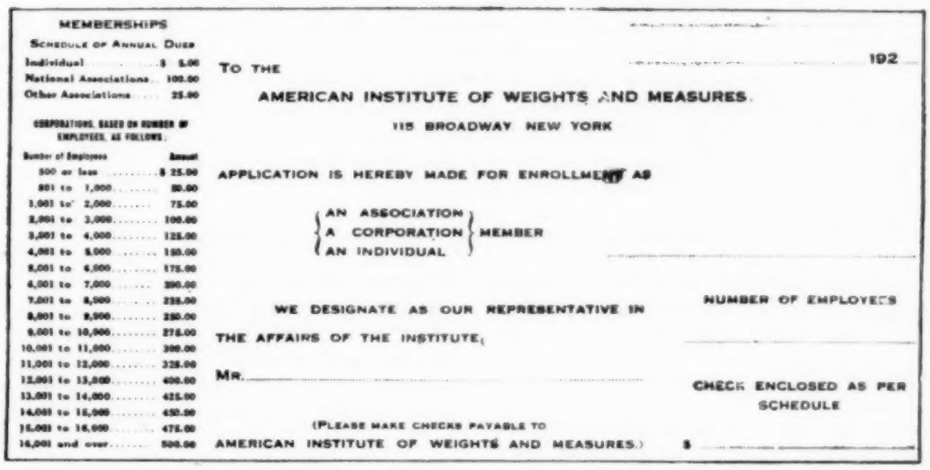
Several hundred prominent manufacturers and firms well known in our National industry are members. The National Association of Manufacturers, The National Founders Association, The National Machine Tool Builders Association and The National Metal Trades Association, are also enrolled in its membership list.

However—like all other things—the American Institute of Weights and Measures must have money to continue acting as the "Watch Dog of American Industry" in guarding against the passage of foolish compulsory metric legislation.

It is better to subscribe a few dollars to have the Institute guard your interests in this matter than to run the risk of paying out the thousands you would have to if a compulsory metric law was passed—and probably many of you would go under in the readjustment struggle with the compulsory metric weight pulling you down.

Get behind the Institute and PUSH.

Ethan Viall
Editor



MEMBERSHIPS

SCHEDULE OF ANNUAL DUES

Individual	$ 5.00
National Associations	100.00
Other Associations	25.00

CORPORATIONS, BASED ON NUMBER OF EMPLOYEES, AS FOLLOWS:

Number of Employees	Amount
500 or less	$ 25.00
501 to 1,000	50.00
1,001 to 2,000	75.00
2,001 to 3,000	100.00
3,001 to 4,000	125.00
4,001 to 5,000	150.00
5,001 to 6,000	175.00
6,001 to 7,000	200.00
7,001 to 8,000	225.00
8,001 to 9,000	250.00
9,001 to 10,000	275.00
10,001 to 11,000	300.00
11,001 to 12,000	325.00
12,001 to 13,000	400.00
13,001 to 14,000	425.00
14,001 to 15,000	450.00
15,001 to 16,000	475.00
16,001 and over	500.00

TO THE _____ 192__

AMERICAN INSTITUTE OF WEIGHTS AND MEASURES.

115 BROADWAY NEW YORK

APPLICATION IS HEREBY MADE FOR ENROLLMENT AS

{AN ASSOCIATION / A CORPORATION / AN INDIVIDUAL} MEMBER

NUMBER OF EMPLOYEES _____

WE DESIGNATE AS OUR REPRESENTATIVE IN THE AFFAIRS OF THE INSTITUTE,

MR. _____

CHECK ENCLOSED AS PER SCHEDULE

(PLEASE MAKE CHECKS PAYABLE TO AMERICAN INSTITUTE OF WEIGHTS AND MEASURES.) $ _____

Problems of Industry and Trade—Editorial Interviews With Men Who Know Conditions

By C. W. PARK

"IN TIME of prosperity, prepare for more prosperity," sums up the philosophy of O. H. Broxterman, of the John Steptoe Co., Cincinnati, regarding the machine tool industry. As chairman of the Committee on Equipment for Schools in China of the National Machine Tool Builders' Association, Mr. Broxterman has been making a careful study of trade conditions and prospects. His investigations have led to significant conclusions, not only concerning export trade with China and other countries, but also regarding undeveloped portions of the American market. For example, a study of how the metal trades should be taught in Chinese schools raised the pertinent question of whether these trades could not be taught better, or rather, more extensively, in American schools. Another parallel situation in the two countries lies in the relation between the machine tool industry and the increasing use of automobiles, trucks, tractors, and modern agricultural road-building, and other machinery.

Changes in the circumstances influencing production are so rapid that they cannot be reduced to a rigid classification. The historian of the reconstruction period may write an interesting story later, when all the evidence is in. Just now the most significant facts and the most helpful suggestions come direct from the men who are engaged in actual production day by day. These men are too busy making industrial history to comment at length, but what they have to say is well worth reading. From time to time the "American Machinist" will publish interviews with prominent manufacturers and other subjects of current interest.

Let European Market Wait

To a representative of the *American Machinist*, Mr. Broxterman spoke optimistically of the present trade situation. He said:

"It is true that unfavorable exchange rates now and unsettled political and economic conditions for several years to come make Europe an unpromising market for American machine tools. The best we can hope for is to keep enough of our tools in European factories to show the superiority of our product over those of Germany and other competitors. The distribution of U. S army equipment sold abroad, and especially the American machine tools supplied for the restoration of Belgium, will help to keep foreign workmen familiar with American machines, and they will be customers later on when conditions are more favorable.

"Just now, the best prospect for expansion of the machine tool industry is in developing further the domestic trade. This should be done immediately, not so much for the sake of the machine tool interests as for the allied branches of manufacturing which depend directly or indirectly on machine tools.

"Answering your question as to how such a campaign for developing domestic possibilities should be started, I believe that one approach must be the public schools. A good many schools have taken advantage of the government's plan to furnish them tools at nominal cost for instructional purposes. Others will purchase tools in increasing quantities and the school market will be just as good in dull years as in times of prosperity. The machine tool companies should take an active interest in developing this market. What remains is to emphasize the metal-working side of a boy's training and give his mechanical instincts an outlet. Too often the so-called 'manual training' courses have been given over almost entirely to woodworking. A boy makes a bird house or a table, and his training ends with amateur cabinet making. There is no objection to his learning to use a saw and hammer, but when you consider that metal work has almost entirely displaced wood, it is time to teach the use of metal-working machines and processes, the elements of automobile mechanism and other common machines, together with their proper use and repair.

"Particularly in the country districts, this kind of practical instruction should be given. A farmer's son, then, would not need to go to the city to develop his mechanical ability, but would become interested in analyzing agricultural machines, trucks and tractors, and in keeping them running smoothly. A boy who showed special talent for using metal-working machines would eventually build up a repair business that would keep a small machine shop going. Incidentally, he would do much to keep agricultural production at top-notch efficiency by insuring prompt and local attention to machinery instead of the long delays incurred by farmers waiting for repairs.

"Whether these local centers start through the schools or through other agencies, such as the automobile, truck, tractor and farm machinery companies, they are greatly needed. The manufacturers of all these kinds of machinery have a direct interest in seeing such shops established, and the initiative will doubtless come from them, rather than from the machine tool men who will supply equipment for the shops. Such a development is inevitable, owing to the wide distribution of machines, and it will provide an almost immediate market for metal-working tools.

Big Opportunities in China

"As for China, that is our big market for the future, if we are far-sighted enough to get ready for it. A country with 400,000,000 people, nearly four times our own population, China offers almost unlimited possibilities. She has immense mineral, timber, and agricultural resources, but is only getting ready to develop them. To show how far behind she has been, it may be noted that she has virtually no improved highways, and only 6,500 miles of railroad, as against 265,000

miles in the United States. The important thing is that China is now awake and is determined to learn from other countries, and particularly from America, to whom she is partial.

"To show what the situation in China is today I could do no better than to quote from some recent correspondence I have had in connection with the work of the National Machine Tool Builders' Association Committee. The following extracts are from letters received from Frank A. Foster, M. E., who has been Director of Technical Instruction in the Chihli Higher Normal College at Paotingfu, China, and also at the Peking Higher Normal College, and has acted as advisor to Chinese manufacturers.

" 'Undoubtedly this is the psychological time for our getting American machine tools into Chinese schools. A nation-wide boycott of all things Japanese has recently been started and is in full swing. The students in most of the higher schools are most ardent in carrying it out. Today's paper states that some 12,000 struck, in Shanghai alone. In some cases they have taken out all the school material of Japanese origin and burned it. They have gone so far as to include their hats and clothes which came from Japan. The students are going out in groups of four to all the surrounding regions to show the people how they can get along without Japanese-made goods and are making an industrial survey of the situation. In the matter of machinery they are looking to America for sympathetic help. I have had several inquiries along that line already.

" 'In the machine shop of the Chihli Higher Normal College there are several Japanese lathes. It does not take long for the authorities to see where the great difference lies, in favor of American machines when put side by side with Japanese machines. They are anxious to get from America a shaper, a planer, and an upright drill as additions to their plant.

" 'I am negotiating with some Chinese capitalists who wish to put up one hundred thousand dollars for establishing some manufacturing along American lines and under American direction. I have given them a proposition which will involve quite a lot of machine tools, and they have considered it very favorably so far.

" 'The boycott goes merrily on, stimulating American trade and encouraging native enterprise. Exchange is very favorable for China just now. There have been times in the last ten years when an American dollar cost $2.50 Chinese. Now, ninety-two cents Chinese will buy an American dollar.'

"One of the greatest needs of the Chinese today is an efficient body of trained instructors in metal working. The recommendation of the Committee of the National Machine Tool Builders' Association is that young men be sent from China to spend a certain amount of time working in American manufacturing plants. In this way they will not only learn the operation of American machine tools but will also become familiar with American industrial organization and American manufacturing methods, and will absorb some American 'pep.' The plan proposed by the committee has met with favor, and arrangements are being made to send over some five hundred young men on this basis. The only difficulty encountered has been with the Commissioner of Immigration, who, Mr. Foster reports, was inclined to the opinion that the young men could not be admitted, since they would work for pay. It is expected that the matter can be speedily adjusted, for the influence of such a group of young Chinese on the future trade relations between the two countries will be far-reaching, and no technicality of law should be allowed to stand in the way of the project. How greatly these men are needed is shown by the fact that, although 1,500 Chinese youths are studying other lines of industry in the United States, none have so far taken up the machine tool industry.

"With improved credit organizations between China and the United States, an active American Chamber of Commerce, a wide-awake consular service, and an American merchant marine to expedite shipments, there is no reason why a considerable expansion of the machine tool trade with China should not be brought about soon. American machine tool manufacturers can well afford to donate tools or sell them at merely nominal cost to Chinese schools and other agencies for instructional or demonstration purposes. In the more remote future, big rewards await those manufacturers who have vision enough to lay the foundation for Chinese export trade."

National Automobile Chamber of Commerce Against Compulsory Metric System

At a meeting of the Executive Board of the National Automobile Chamber of Commerce, held on March 3, 1920, the following resolution was adopted:

"WHEREAS, Efforts are being made to require by Congressional Legislation the use of the Metric System of Weights and Measures in this country, and

"WHEREAS, A canvass of motor car manufacturers, members of this organization, has failed to develop that any of them are in favor of such legislation owing particularly to the difficulty at this time of changing dies, factory equipment and mechanism and the great cost of same; also the confusion that would be created among workmen who have not been educated in the metric system, be it

"RESOLVED, That this Board is opposed to legislation making the use of the metric system of weights and measures obligatory, and recommends that members of the National Automobile Chamber of Commerce lend their support to the American Institute of Weights and Measures, which is actively opposing this movement."

Recent Papers of the Bureau of Standards

The Bureau of Standards recently issued two more of its Technologic Papers giving the results of tests which it has lately performed. Paper No. 150 is called "Physical Tests of Motor-Truck Wheels." It is written by C. P. Hoffmann, an Assistant Engineer Physicist of the Bureau. Paper No. 151 is entitled "Load Strain—Gage Test of a 150-Ton Floating Crane for the Bureau of Yards and Docks, U. S. Navy Department," and is the work of L. J. Larson and R. L. Templin of the Bureau staff. Copies of these papers may be obtained by addressing a request to the Bureau of Standards at Washington, D. C.

Paper No. 150 deals with the procedure and the

results of tests made upon twenty-one different types of truck wheels suitable for use on class "B" military trucks. The compression under radial load and the deflection due to side thrust were determined, stress-strain curves under these conditions being given for each wheel. The distribution of the stress throughout the various parts of a wheel under load was determined for one specimen. The data, results and conclusions are contained in a pamphlet of over sixty pages.

The other paper, No. 151, treats of a test made upon a big shipyard crane of recent design for the purpose of determining the stresses and the action under load. The crane was subjected to a maximum load of 180 long tons, the deflection at various points was observed, and the stresses in the different members were determined by means of a Berry strain-gage. In the paper the distribution of the loads is analyzed and the stresses of the members are presented in the form of curves. This booklet contains about thirty-five pages, is well illustrated and is of interest because of the fact that a crane of this type, built earlier for use at the Panama Canal, failed under load.

What Machine Men are Thinking About

EDITORIAL CORRESPONDENCE

Machinery dealers in various cities, including Rochester, Buffalo and Cleveland, report good orders and slow deliveries in most lines. Automobile building gets most of the machinery either directly or indirectly. The fact that material is hard to get may reflect itself in a decreased demand for machinery where deliveries are too far distant.

It seems to be pretty generally conceded that the automobile output has had to be cut to about 60 per cent of the original estimate of the year, which accounts for delayed deliveries of some of the more popular cars. Just how long this will last or how it will affect the business next year, remains to be seen.

Then, too, there is the effect of the increased price of fuel to be reckoned with, as there are indications that gasoline is going much higher than ever before. If this occurs it is sure to have its effect on the type of cars demanded even if it does not curtail the number sold and used. It is generally conceded that we must follow the trend of other countries with high priced fuels and use lighter cars with smaller and more efficient motors.

PIECEMEAL BUYING

Some machine dealers are buying only as machines are ordered, following the consumers plan of putting it off as long as possible. So far this has not been a paying game as prices have not lowered but advanced in a number of instances.

On small tools, dealers are compelled to keep ordering ahead to insure any sort of a supply owing to uncertain deliveries, but as one remarked, "they might be pinched for ready money to pay if deliveries should be suddenly hastened to any considerable extent." A new feature in the small-tool trade is the offering of English twist drills in the American market during the last few months. This is a decided innovation and one that, according to one well known dealer, does not seem a serious menace unless we refuse to be contented with normal profits.

Going from drills and other small tools to heavy machinery such as huge planers and boring mills, we are again confronted with competition from abroad. As one well-traveled machine man put it, large machine tools are not quantity production propositions but must of necessity be very largely special and built without elaborate jigs and fixtures. This means more or less all around machinists, at day wages and high grade men at that.

Our specialty in this country is mass or large quantity production with jigs, fixtures and even special machines built for the particular job. On this work we use semi-skilled men, or even less, and get production at very low costs. We have very few all-around mechanics because we have not trained them, and according to the observations of the same, we have very little chance of competing with either England, France or Belgium on any kind of work where they are required. And as long as all export trade must in the long run resolve itself into an exchange of commodities of some kind, why not, he asks, supply them with the machines we can build best and cheapest, taking in exchange the kind of machines which they can build more cheaply than we can.

MONEY IS LESS FREE

Here and elsewhere there is a tightening up of the money market, loans are more difficult to secure and many are wondering when we will get to the peak of the selling curve. One machine builder who has weathered several financial storms, feels that we are a bit over the top already. The tightening up on loans is to curb speculation and ought to help some, according to close observers. The only fear expressed is, that in some cases where the preparatory outlay has been somewhat more than anticipated, the stopping of all further loans may prevent a perfectly sound business from getting a fair start. This is not theoretical but based upon the observer's experience in a previous occasion when the bankers were not broad visioned enough to see beyond the immediate future, or to realize the effect of preventing the completion of the plans under way.

Those who are in close touch with both sides of the industrial problem are by no means sure that our previous experiences are likely to be replaced as to the final outcome of another sag in the business curve.

A Rotatable Table for the Radial Drilling Machine

BY C. E. LICHENBERG

In some shops where the work is too large to be covered by the radial drill in one setting, much handling can be avoided by constructing a removable and rotatable table supported on flanged rollers running on an endless track of the desired diameter. When great accuracy is not essential, the table may be of angle iron covered with boards, should this prove cheaper than cast iron. The ends of the track rail may be welded or joined by fish plates, and machined true on a vertical boring mill.

The table can be rotated by pinch bar, ratchet, or other means, and can be locked to the rail by means of a clamp.

This suggestion is the result of past experience in the loss of time and production by excessive handling of material.

WHAT *to* READ
—for the man in a hurry

Suggested by the Managing Editor

IT IS always a simple matter to tell the other fellow how to run his business—particularly if you are strong on glittering generalities. But to our way of thinking the best way to help a manager or a company, struggling to improve a business, is to place before them clear accounts of the methods employed in other plants and leave them to draw their own conclusions.

With this end in view we have made an extra effort this week to present a group of major articles dealing with various phases of the management problem.

The leader is Fred Colvin's story—or rather the first part of it—of the way in which the White Motor Co., of Cleveland, is handling the "personal relations" side of the question. Raising wages 130 per cent and at the same time increasing the selling price of your product only 10 per cent, indicates a successful system, and—but read the story if you want to know how it was done.

Part II of Mr. Basset's "Modern Production Methods" begins on page 873 and takes up the purchasing agent's job. The first part of this series which appeared in our issue of April 8 dealt only with the importance of the subject and gave a general survey of the field. Mr. Basset gets right down to brass tacks this time, however, and gives valuable details concerning the method and forms used in modern purchasing departments. He tells how one purchasing agent reduced his belting expense from $17,000 to $12,000 annually while output increased 35 per cent and cost of belting 50 per cent. Sounds worth while, doesn't it?

Over on page 880, Mr. O'Shea of the Greenfield Tap and Die Corporation recounts the method of handling large quantities of raw stock and comparatively small parts in that plant. This article is chock full of details.

Hunter's article on pattern storage, page 901, is also along the same general line. It gives a short account of a system used for preserving seldom-used patterns in a readily accessible way.

On page 889 is part VIII of H. H. Manchester's "Evolution of the Workshop." This shows how work was done just before the beginning of the machine-tool era. Mr. Manchester has unearthed another lot of queer old pictures to illustrate the shops of that time. How would you like to operate a grinder all day long (and a day *was* a day in those days) lying on your stomach? See Fig. 49. This was not done because the mechanics were born tired, but to protect them from the abrasive dust.

Nobody who is holding down a man's job has time to read all of the "American Machinist." On the other hand there are some articles in every number that you can't afford to miss. We are running this page to save your time by pointing out the articles in this issue that are aimed at men holding jobs like yours. Read the editorials —they are short and to the point. The "Sparks" will give you the latest news of the machine industry. The "Shop Equipment News" columns show the innovations in tools and methods.

Most of us are so used to fussing with square yards or bulky bundles of awkward blueprints that we look upon them as a necessary evil, like getting a haircut. But here comes one Frank Richards on page 871, who has the nerve to suggest that blueprints aren't really necessary! As he says, "If not, why not?" We will leave it to you to find out why not. There is certainly food for thought in this short article.

Practical applications of the discoveries of pure science have become more and more frequent lately and more and more useful. On page 892 is a description by two of the specialists of the Bureau of Standards of a method of testing steel bars for flaws without injuring the test pieces at all. If this happens to be in your line, you don't want to miss it.

We have blazed away at the "World Trade Club" until you are probably as sick of that name as we are, and that's quite some. There is another organization which we want to call to your attention and it is the American Institute of Weights and Measures. It has fought the metric fanatics from the start and well merits your support if you have a sincere regard for American industry. Pages 904 and 905 tell the story.

In this issue on page 906 is the first of a series of interviews with leaders in the machine-tool industry. The series is conducted by Professor Park of the University of Cincinnati.

On page 903 we note the passing of another of the old school of master mechanics, Dr. John A. Brashear. Our account was written by Ashton Hand, a close friend and admirer of Dr. Brashear. The lives of men like Brashear and See should be an inspiration to the younger generation of machinists and engineers.

Fixing the Compensation of Engineers

[From a Committee Report to the Engineering Council]

In order to determine what is a fair rate of compensation for engineering service at the present time, the question may be approached from two different points of view: First, what increase should be made in engineers' pay to compensate for the great reduction in the value of the dollar which has taken place in the last five years? Second, how may the intrinsic value of engineering service be determined?

A GREAT deal of misunderstanding and injustice would be avoided in all our industrial relations were there a clear understanding of the fact that all prices today, whether of wages or salaries, or commodities, must be compared with the change which has taken place in the value of the dollar before it can be determined whether the price, measured by an absolute standard, has moved up or down. It should be obvious to everyone that the value of the dollar is measured solely by its purchasing power. Whether it be a dollar received as wages by workmen, a dollar received as salary by an engineer, or a dollar received by a manufacturer in payment for goods sold, the actual amount of value which will be received in each case will depend upon the average amount of other commodities which the dollar received will purchase.

Changes in Prices

The "index numbers" which are regularly published by various statistical bureaus are an average of the wholesale market prices of a large number of standard commodities. In making up the index numbers the prices of the different commodities and classes of commodities are weighted in proportion to the per capita consumption of each. Thus, a comparison of the index number at a given date with index numbers at preceding and following dates shows the change in average wholesale market prices and such a comparison shows also the change in the purchasing power, or value, of a dollar in the wholesale market.

In order to determine the change which has taken place in the value of the dollar it is necessary to investigate changes in retail prices as well as those in wholesale prices. Especially where wages and salaries are concerned, it is the changes in retail prices that determine the buying power of the dollar received.

In general, the changes in retail prices follow the general course of the changes in wholesale prices. There is, however, more or less variation in different localities. Where such variation occurs it will generally consist in a greater proportionate increase of retail than of wholesale prices. Under the stimulus of the abnormal demand of the past five years, which is chiefly responsible for the great increase in prices, it is common knowledge that the retailer has frequently advanced his prices faster than the wholesale dealer.

The curve showing the percentage of increase in prices plotted from the Dun index numbers, therefore, in so far as it is in error in indicating the change in the value of a dollar spent in retail purchasing, is in error by understating the decrease in the value of the dollar which has taken place.

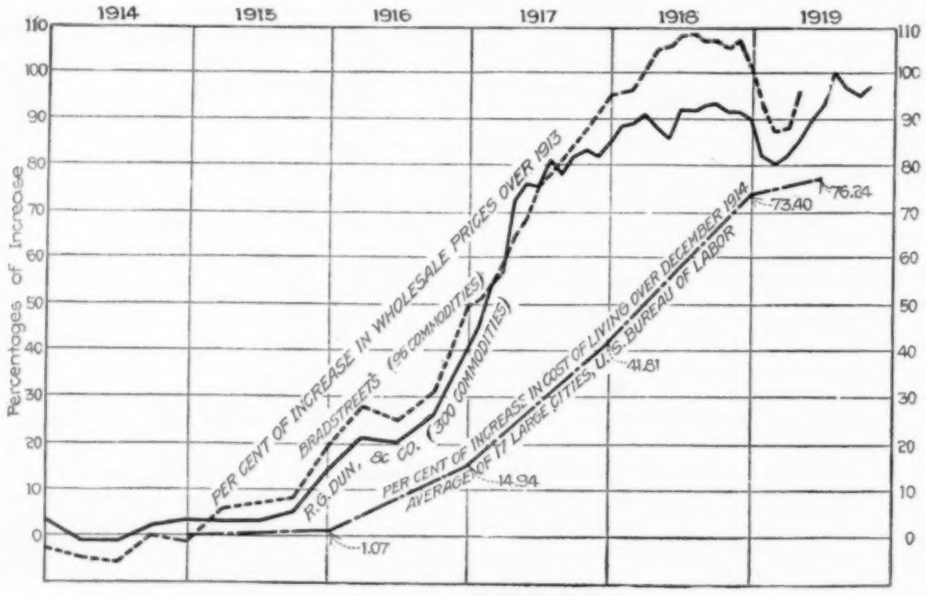
Changes in House Rents

In the long run the prices paid for house rents and for personal service change to correspond with the change in commodity prices; but rents change more slowly than the market prices of commodities, so that allowance must be made for this "lag" in determining the change in value of the dollar. This is especially the case where such a sudden and rapid increase in market prices of commodities occurs as has taken place in the past five years.

Furthermore, the rise in rents varies in different cities. In some munition towns, rents rose with a bound in 1915, and so did prices for personal service. In most of the larger cities rents did not rise materially until 1919.

In order to determine accurately the change in value of the dollar in a given community, therefore, an estimate must be made of the change in retail prices compared with wholesale, and of the rate of change in rents and personal service charges.

Since June 1, 1919, there has been a great increase in house rentals all over the country. There are no statistics to show the amount of this increase and its effect on the cost of living, but there is good reason



INCREASES IN COST OF LIVING

to believe that this increase, coupled with the general increase in charges for personal service that has taken place during 1919, and the advance of prices by retail merchants at a greater rate than the wholesale price increases is sufficient to make the percentage of increase in the cost of living indicated by the Dun statistics a true record of the change in value of the dollar at the present time.

The customary reference to the general increase of prices above reviewed as "the high cost of living" has tended to confuse the minds of many people. Some employers have argued that the high cost of living was not their affair. They have declared the real trouble to be "the cost of high living." On the other hand, engineers or other professional workers, and many classes of salaried men have hesitated to press claims for increased pay on the ground that changes in the cost of living make it difficult to live on their incomes. Such men rightly feel that their living expenses are their own private affair.

When, however, it is clearly understood that what has taken place is a change in the value of the dollar, the claim for an increase in the rate of pay measured in dollars rests on entirely different ground. The proper and dignified position for the engineer is to assume that his work should receive at least the same compensation in absolute value that it received five years ago and that therefore the compensation measured in dollars should be increased by whatever amount is necessary to offset the decreased value of the dollar.

There can be no denial of the justice of this claim even though the difficulty of satisfying it to the full extent in many departments of engineering work is recognized. The compensation of many engineers is dependent upon laws and ordinances, custom and precedent. Great inertia must often be overcome to effect a change. In many cases the compensation of the engineer, like that of many other public servants, is dependent upon revenue raised by taxation; and the difficulties in increasing tax rates to correspond to the great decrease in the value of the dollar are known to everyone.

Engineers engaged in business on their own account have to meet the difficulty of raising their fees to offset the changed value of the dollar, a task especially difficult in fields of engineering where work is inactive and the competition for it is keen; yet without such increase they cannot adequately raise the pay of their own employees.

This illustrates anew the urgent need for emphasizing the change in value of the dollar, rather than the change in living costs. The former is at once recognized to bear directly on fair prices for goods sold and for the fees charged by professional men as well as on wages and salaries.

On the other hand, there are cases where there is no real obstacle to a prompt adjustment of the engineer's compensation to the full amount indicated by the decreased buying power of the dollar. In carrying on construction work, the salaries paid to engineers are a small percentage of the total cost. The wage workers, both those organized in trade unions and even the unskilled and ignorant laborers on the work, have received increases in compensation in many cases fully equal to the change in the value of the dollar and in some cases far exceeding it. If the engineers on such work are paid the same percentage of the total cost that they were in 1914, their increased pay will fully offset the changed value of the dollar. The same thing is true of engineers employed in manufacturing industries, and here the compensation of engineers has been largely increased.

At this time especially, employers who represent invested capital and those responsible for work in the public service, stand in great need of the loyal support and co-operation of their salaried professional staff. It is exceptional where salaries have been increased to correspond fully to their decreased purchasing power.

The injustice in thus reducing the rate of compensation for loyal and efficient service paid to the very men on whose brains and fidelity the country is more dependent than on any other class is truly a fatal error.

The present price level is not considered merely

Railroads Oppose Compulsory Metric Legislation

To the Editor:

In view of the efforts now being made at Washington to persuade Congress to enact a law providing for the "compulsory introduction of the Metric System" the following reasons suggest themselves as to why such action would place an unnecessary burden on the railroads and incidentally on the people at large, for the reason that in the last resort the people must pay for all of these excessive and unnecessary expenditures:

1. The railroads of the country have spent several million dollars preparing plans in compliance with Valuation Orders of the Interstate Commerce Commission. These plans, as well as other plans, both of right-of-way, structures, standards, etc. will become, in effect, obsolete and their replacement would eventually be necessary on the metric system. This would entail a very large expenditure.

2. The enactment of this law would cause all freight tariffs to be revised and readjusted from their present pound and ton basis. This would not only involve a very large expense but great confusion and the loss in connection therewith would be intestimable.

3. All passenger tariffs would also have to be revised and changed from their mileage basis of calculation.

4. Platform, wagon and track scales would be of no value as they now exist until they were remodelled and changed to meet the requirements of the new measure. This would result in throwing away and scrapping a large amount of valuable railroad property.

5. In addition to the above would be the expense incident to educating railroad employees to adapt themselves to the new system and the resultant confusion in connection therewith.

6. It seems to me we ought to let well enough alone. The present system is taking care of all our requirements and there is no sound reason for any change. I sincerely hope that no such drastic proposition will get any serious consideration from Congress.

(Signed) B. A. WORTHINGTON,
President, The Cincinnati, Indianapolis and Western Railroad Co., Indianapolis, Ind.

temporary by such of our Government agencies as the Department of Labor and the Federal Reserve Board or by such economists as Irving Fisher and J. S. Holden. Substantial relief from the high cost of living therefore cannot reasonably be expected through a decrease in prices; it must be met by increases in salaries.

The Intrinsic Value of Engineering Service

It will be generally agreed that the salary of an engineer ought to be at least sufficient to enable him to live in the manner which his position and responsibility call for, and in addition to repay within a reasonable time the investment in time and money he has made in gaining the education and experience which is necessary for his work.

There is a wide general acceptance of the principle that the worker in any occupation should receive at least a reasonable living wage. By a "living wage" is meant the amount which will maintain in decency and comfort both the incumbent of the position and his dependents.

There are certain positions which are ordinarily occupied by young men and women who are starting on their life work and who have not yet assumed family responsibilities. In so far as the incumbents of these positions fill them temporarily as a means of advancement to positions of greater compensation—in effect serving as apprentices—the living wage need not be based on a "family" standard.

When, however, any position is likely to be occupied more than temporarily by individuals of an age at which they should naturally assume family responsibilities, the minimum salary for the position should not be less than that necessary to maintain an average family in respectability.

Why Engineering Work Has Been Inadequately Paid

Unfortunately there has been, for fully a decade, a tendency to lower the pay of engineers. The law of supply and demand has operated to reduce the pay of engineers in many branches of the profession far below reasonable standards.

This has not benefited the public. On the contrary by paying too low a rate for engineering service, the inevitable tendency has been to lower its quality. This has been especially marked in the case of engineers in Federal, state and municipal service. Here the inertia which prevails in all public affairs has prevented the engineers from receiving more than a trifling part of the increase in pay, measured in dollars, that is required to offset the shrinkage in the dollar value.

The obvious result has been to drive out of the public service the best and ablest men, who can obtain better positions elsewhere, and to leave only the men who by reason of age or inferior ability cannot make such a change.

Cheapened Engineering Service Means Waste and Danger

It cannot be too strongly emphasized that the public loses through cheap engineering service many times the amount it may seem to save through lower salaries. The professional engineer in a responsible position in designing, constructing or executive direction of important work should have initiative, sound judgment, broad knowledge and executive ability. Lack of these qualities often results in great loss of money, often by needlessly increasing the cost of work of which the public never knows. Safety of life and limb is also so frequently dependent on the skill and fidelity of the engineer that danger is incurred when the quality of engineering service is sacrificed through a false idea of economy. The investigation of the Quebec bridge disaster of 1907 showed that the engineer primarily responsible for the safety of its design was being paid at so niggardly a rate as to be unable to provide a sufficient and competent staff to supervise the work properly.

Movement to Benefit Public

The movement, therefore, to give engineers just compensation for their services is not merely a movement for the benefit of the engineering profession. It is even more a movement to benefit the public by securing for it a high quality of engineering service.

This matter deserves emphasis here because where readjustment of salaries has taken place to compensate for the changed value of the dollar it has been common to confine the increase to the lower paid men and to do little or nothing for the men receiving salaries above $2,500 to $3,000. There is no longer an excuse for this, as the above review amply proves. The measure of seeming economy, also, is very small; because the engineers in the higher positions are few in number compared with the rank and file of professional workers.

It is frankly recognized that there is another class of technical work of a routine order which calls for little in the way of initiative, originality or judgment. Much of this routine technical work in the field, the office, the shop, or the laboratory can be and is being done by boys and young men with limited education and no more training than that afforded by a correspondence school or a few months' study in a trade school. Most of this work does require, however, a degree of reliability and fidelity which deserves fair compensation. The best guide to fair rates of pay for this class of technical workers is found by comparison with the standard rates of wages paid to skilled workers in the trades. These workmen are now generally receiving rates of pay much higher than the routine technical worker and in many cases higher than even the engineer who carries large responsibility for design or administration.

Government Technical Employees Do Not Get a Living Wage

The Federal Government is now paying thousands of its highly trained clerical and technical force less than a living wage. Except for the temporary bonus of $240 a year for positions paying salaries of $2,500 or less, no attention has been paid to the constantly diminishing purchasing power of the salaries paid to this class of employees. On the other hand, the Government has given full recognition to increased living costs in fixing the wages of organized labor.

A "shipfitter" in a navy yard, for example, receives $1,750 a year while he is learning how to do his work. After three months of apprenticeship he gets $2,000. If he is made a "straw boss" in charge of twelve or more men, he gets $2,450, and if a "sub-foreman" in charge of thirty or more men, he gets $2,900. A blacksmith (heavy fire) gets $2,400. A "hammer and machine forger" (heavy) gets $3,700.

There has been reluctance to raise salaries to correspond to the changed value of the dollar because of the idea that prices were to drop back with the conclusion of the war. So far from this being the case, the records show that following the lull in business after the armistice, prices have risen above even the war-time scale and are now at the highest point ever reached. Business has largely readjusted itself to the changed conditions and the activity in some lines exceeds that registered during the war.

The only two things which can restore prices to their former level are increased production or decreased consumption. World-wide disorganization of industry and of government, deficient capital and deficient transport facilities all tend to reduce production. The world of consumers, long held down to a war diet and war clothing, now eagerly seeks to replenish its larder and wardrobe and to repair and renew its stock of buildings and machinery.

The Outlook

The outlook is that it will take years to again organize the world's equipment for production and distribution, including finance, transportation by land and sea, and merchandising, so that the demands of consumers may be met as before the war and prices be brought back to former level.

It may well be argued further that the high scale of prices or low dollar value has continued now for fully three years. During that time the engineer who has had but little increase in salary has suffered a heavy monetary loss through causes entirely beyond his control.

In many instances the amount paid for skilled labor is greater than the amount paid to the trained Government engineer. Over forty of the labor crafts were awarded a rate of wage of $2,000 and more by the Labor Adjustment Board.

The skilled laborer is not required to know how to read or write, and he may receive full pay after an experience varying from two weeks to six months. The Government engineering employee, on the other hand, to get an equivalent amount of pay, must have had from two to eight years' experience if he is not a technical graduate, and in many instances will not be admitted at all without a technical degree and then only with from two to four years' practical experience.

Many other comparisons might be made between the worker at a trade or the factory employee and the routine worker in engineering, showing how low is the pay of the latter compared with the former; but no further proof is necessary to show that the technical worker is not receiving what his services are worth.

The Inevitable Result

The inevitable result of such underpaid service is a deterioration in its quality. The men in these lower grades have as a rule not the same incentive of professional pride that often keeps the men carrying larger responsibilities faithfully at work, even when their pay is inadequate.

Even though a temporary oversupply of men trained in engineering work may make it possible to keep salaries for these brain workers below the wages of laborers, the inevitable result will be a dissatisfied working force, which carries out the daily routine without energy or good will, and the public's work will not be done with efficiency or economy.

"Spiral" Gears Again

By Joseph C. O'Brien
Chairman of the Worm Gear Com. A. G. M. A.

Referring to an article which appeared on page 278 of the *American Machinist* entitled "What's in a Name?" by E. M. Long, the writer, as Chairman of the Standardization Committee of the American Gear Manufacturers' Association, on Worms, Worm Gears and Spiral Gears, takes the liberty of replying to that portion which refers to worms and spiral gears.

There is no use in being too fussy about such matters as we must draw a line somewhere. If we try to make the name describe the gear technically, its manner of use and manner of operation, we would have to have a composite name which would be too cumbersome for ordinary everyday shop use.

It so happens in this case that we have a gear which may be technically described as a helical gear, that may be used in the commonly accepted sense, either as a helical gear, a worm or a spiral gear. To those who are extremely technical, these terms may be considered as a nick-name or trade name which designates only the gear's manner of use. I agree with Mr. Long that what is commonly called a single thread worm, is technically speaking, a true helical gear; however, either a worm, spiral or helical gear may have any number of threads or teeth whatever and should take its name from the manner in which it is used.

For example, suppose we take a six-thread true helical gear. If we mesh this gear with any other helical gear having teeth of the same angularity and opposite hand, the shafts will be parallel and in the same plane, such gears are known as "helical spurs or helical gears."

If we now take this same gear and mesh it with a helical gear having teeth of the same hand, the shafts will still lie in parallel planes, but will be askew to each other. The shafts may have any angle with respect to each other between zero and 180 deg. Such gears are known as "spiral gears."

If we now mesh this same helical gear with a wheel, in which the teeth have been conjugated by a facsimile of the helical gear itself, either by the hobbing method, fly-tool method or similar method, and the outside face of the wheel is concave so as to embrace the periphery of its mate, we have what are known as worm gears. The member having the straight face is known as the worm and the member which has the concave face is known as the worm gear.

When both members of the drive have a concave face the yare known as Hindley worm gears. The term "Hindley spirals" is led where the angle of the teeth is such that either gear will drive freely in either direction.

In ordinary practice helical gears are seldom made with less than 8 to 10 teeth, and seldom have greater than a 45-deg. helix angle. Worms seldom have more than 6 to 8 threads and seldom have less than a 45-deg. helix angle, and spiral gears are frequently used with as low as triple, double and even single threads, and the angle of helix varies from zero to 90 deg.

If the terms, helical, spiral and worm are limited and used in the sense explained, they will convey the idea of the manner of use, which is really the more important matter and to the writer's mind, for practical purposes, there is no need of a more descriptive name in either case.

EDITORIALS

Have We Over-Specialized?

THERE is a growing belief in the minds of some of the progressive thinkers along management lines that we may have overdone the specialization of workers in the shop; that the subdivision of work into operations and sub-operations may have been carried too far for real efficiency.

Some who have studied the question carefully are convinced that, while it may be possible to train workers to perform one operation in a very short time, the result is not always satisfactory as it fails to enlist their interest in the work. And lack of interest is not conducive to maximum production or to the spirit of co-operation, on which both production and shop harmony so largely depend.

We are apt to complain that workers in the shop no longer take the same interest as of old but we forget that our efforts toward efficiency have been largely responsible for their attitude. The man who only knows that the piece he works on is "PX2" and has no idea where it goes or what it does, can hardly be expected to show much enthusiasm in his work. True, he might find out by inquiry, but even this is sometimes rebuked by petty executives alone. This attitude discourages workers with limited initiative and affects production more than we realize.

Is it not better to encourage interest by seeing that workers know what they are working on, what it does and why it must be made accurately? This can be done in different ways, depending on the machines and the way in which the shop is run.

The method, however, is not important. The main thing is to realize that the more we specialize a man into an attachment to a machine, the less we can expect interest and co-operation. And it is time we were realizing the effect of these on production.

The Compensation for Engineers

THE report of a committee of the Engineering Council regarding the compensation of engineers, should be carefully considered by plant managers and by all citizens who want the best engineering service in all community activities. This report points out clearly that the only basis for consideration is the purchasing power of the dollar, and that this has been growing less ever since 1914.

There can be no question as to the necessity for increased production in all lines, and who can play a larger part in securing this than the engineer? But there has been all too little incentive in the way of increased salary to enocurage the average engineer to exert his best efforts in this line.

Then, too, both the engineer and the intelligent workman know too well that there are many cases where the cost of production bears no direct relation to the selling price. A slight increase in labor and materials is multiplied several times before the retailer passes it on to the consumer.

Manual labor, both skilled and unskilled, has demanded and received advances which probably will average to at least cover the decreased purchasing power of the dollar.

Does management realize that by failing to advance salaries of highly trained men, those who have spent years at college and in securing their experience and training, it is giving notice that organization and demands are the only way to secure the proper compensation for engineers?

Engineering unions are already under way. Whether they flourish or pass away, depends on the way in which management meets the situation. As long as management continues to pay an engineer as little as it can, and to pay unskilled men high wages because it must, it is encouraging the formation of wage organizations and destroying the close bond of sympathy and co-operation which is so necessary, especially with the engineering staff.

The relations between the management and the engineers should be of the closest. Men of this intelligence do not expect impossibilities and could be keenly interested in any fair proposition to make their income proportional to the services they render—to give them a direct return on the results of their efforts. But whatever be the method, it must be clear to all that engineers must be paid more fairly for the services they render.

The attitude of the Congressional Committee investigating the remuneration of Government employees is an encouraging sign. That section of the report of this committee which refers to mechanical and automotive engineering positions, and which was published in the *American Machinist* for April 15, recommends rates of pay that are more commensurate with present living costs than are the salaries now received by some of our ablest engineers. States and municipalities should follow suit.

Reducing Spoiled Work

WE have been so accustomed to consider only the mechanical side of manufacturing problems that we too often fail to consider the other factors which enter into them. The last paragraph of the very instructive letter by John Adendorff, factory manager of the Brown-Lipe-Chapin Co., which appears on page 919 in this issue, is very illuminating and deserves careful consideration. Bad air and spoiled work are not usually connected in the mind of the mechanical engineer or the factory manager—yet they are probably more closely related than many of us realize.

In a similar way bad air, or a lack of sufficient good, fresh air, is doubtless responsible for many mistakes in both office and drawing room. It is a hopeful sign when managers of large shops are considering non-mechanical details.

The human factor deserves more attention than the mechanical just at present.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and equipment

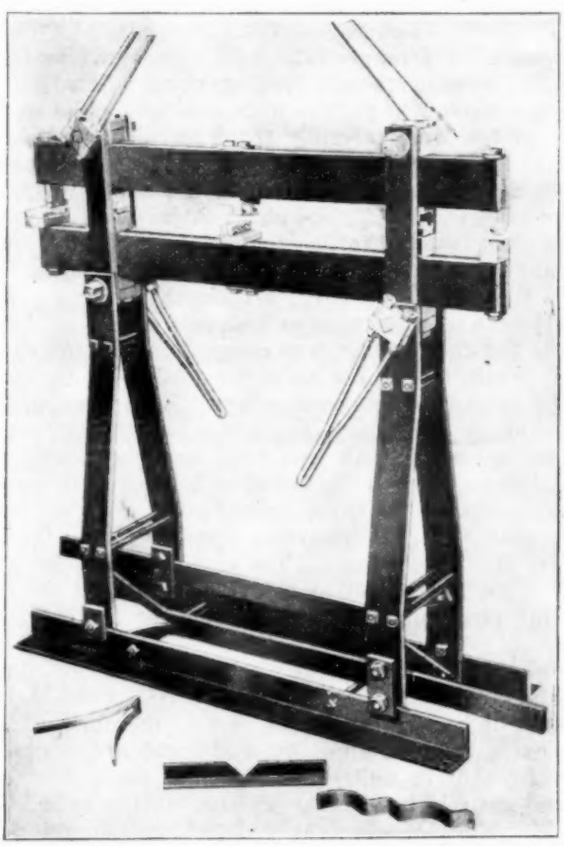
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs and equipment

Armstrong-Blum Marvel No. 23 Punching and Bending Machine

The No. 23 punching and bending machine shown is made by the Armstrong-Blum Manufacturing Co., 333 North Francisco Ave., Chicago, Ill. This machine has an eccentric and link arrangement at each end operated by hand levers. The tool-carrying bars are 4 ft. long which gives 40 in. between links and permits a number of punches and dies to be placed in this space in order to punch several holes in a wide sheet at the same time.

The machine can also be used with V-block benders, notching dies, or shears.



MARVEL NO. 23 PUNCHING AND BENDING MACHINE

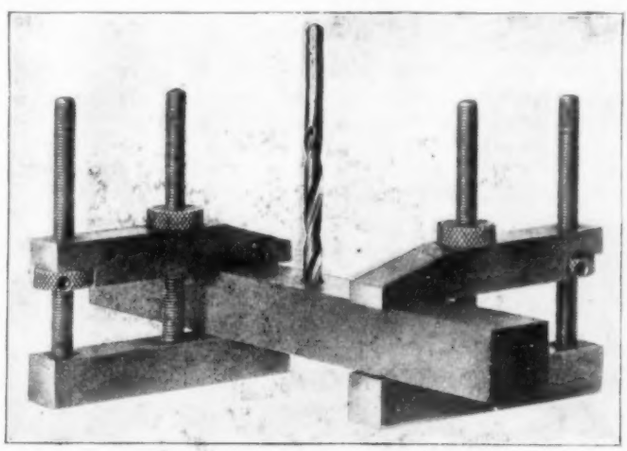
Specifications: Capacity, will punch $\frac{3}{8}$-in. hole in $\frac{3}{4}$-in. steel with 2-in. throat, or $\frac{1}{2}$-in. through $\frac{3}{4}$-in. with 9-in. throat; will shear $\frac{3}{8}$ x 2-in. bars; vertical travel of tool-bar, $\frac{7}{16}$ in. with one lever, or $\frac{7}{8}$ in. with two levers; space between upper and lower bars, $3\frac{1}{4}$ in.; height, 50 in.; length, 48 in.; width, 17 in.; weight, 475 lb.

The legs are so mounted on the angle-iron base that they may be shifted in or out to change the depth of the throat on both ends of the machine. The bars, links and lever are of heat-treated steel.

Knauel Toolmakers' Parallel Clamps

The Knauel Tool Works, Rock Island, Ill., has brought out the toolmaker's parallel clamps shown in the illustration.

The clamps are made in two sizes, the No. 1 with



KNAUEL TOOLMAKERS' PARALLEL CLAMPS

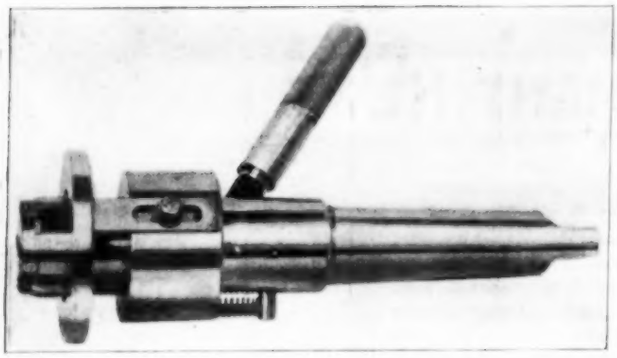
1¼-in. opening, and No. 2 with 2¼-in. opening. A feature of these clamps is that the screws project on one side only, permitting their use in close quarters or standing in an upright position while holding the work. They are rapidly adjusted and may be tightened by the fingers or by using a pin on the rear nut.

Victor Collapsible Pipe Tap

The collapsible tap illustrated herewith is a late addition to the line of tools manufactured by the Victor Tool Co., Inc., Waynesboro, Pa.

It is used for tapping pipe threads in fittings and flanges but instead of being tapered or having tapered chasers it is provided with short straight chasers that automatically recede as they advance into the hole, the correct taper being given to the threaded hole by a cam which controls the chasers. As the maximum size of the taper hole is tapped first, it will be seen that the hole can not be tapped too large by running the tap too far in as would be the case with a taper tap.

It is claimed that as the work is all done by the



VICTOR COLLAPSIBLE PIPE TAP

ends of the chasers, less power is required to tap a hole than if a taper tap was used.

Taps of this type can be made in sizes from 2 to 12 in.

Herlth Adjustable Parallels

The adjustable parallels illustrated herewith are made by the O. B. Herlth Manufacturing Co., 32 Union Place, Hartford, Conn.

The parallels are hardened, ground and lapped. It is claimed that their accuracy is within 0.0001 in. and that they may be stacked in all combinations with uniform results.

They may be used independently or in combination with precision blocks for such work as gaging slots, setting sine bars, buttons, snap gages, etc.

HERLTH ADJUSTABLE PARALLELS

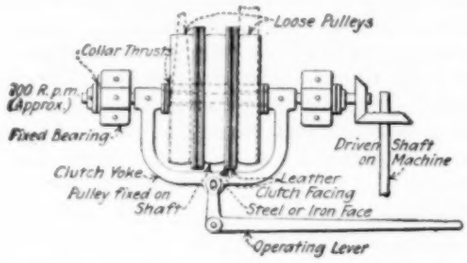
Each set comprises five adjustable parallels varying from $\frac{1}{2}$ to $\frac{3}{4}$ in. minimum thickness and from $\frac{7}{8}$ to $1\frac{1}{4}$ in. maximum thickness.

A Simple Quick Reversing Clutch

BY H. H. PARKER

The sketch shows a cheaply constructed reversing clutch which is well adapted for a drive requiring quick action but where no large amount of power is required. The clutch as described was used to drive, through bevel gears and screw, a piston working in a long cylinder which forced out a plastic material under considerable pressure through a small nozzle. As it was desired to be able to shut off the pressure instantly, this was accomplished by reversing the direction of rotation.

No sticking of the friction surfaces could be tolerated, hence the use of plain disks. The apparatus worked satisfactorily under these conditions and it would seem



A SIMPLE AND CHEAP REVERSING CLUTCH

that such an arrangement could be adapted to other uses, as an extemporized tapping machine, etc.

Three wood split pulleys were used; the sides of the rims of one were carefully trued up, also one side of each of the others. Then two disks of iron were screwed to the first pulley and one each to the other two, these disks being made of plate about $\frac{1}{8}$ in. thick. Leather disks were fastened to the iron disks by means of countersunk copper rivets to act as frictional engaging surfaces. Probably some regular clutch lining material would have been better than leather.

The two-faced pulley was clamped fast to the clutch shaft while the others were provided with babbitted bushings and ran as loose pulleys. Each bushing was faced off on the outside end and a ball thrust bearing set up against it. An iron yoke was then forged up, the distance between the forked ends being wide enough to accommodate the three pulleys and two thrust bearings plus a narrow clearance space between the adjacent friction surfaces. The ends of the yoke were drilled out and babbitted to fit the shaft and the connecting piece provided with a pivot for the operating lever.

Two babbitted dolly boxes and two more thrust bearings completed the essential parts of the device.

As will be seen from the sketch, the forward and reverse motion, obtained by a straight and a crossed belt from drive pulleys on the line shaft, was controlled entirely by manual pressure on the hand lever, the clutch never being engaged in either direction for any length of time.

While the loose pulleys might have been made of cast iron, wood was best for the reversing center pulley as there would be less inertia; though for a more elaborate set-up aluminum alloy could be used

What Other Editors Think

Metric Chaos in Daily Life

(From *The Iron Age*)

A STAGGERING PROGRAM OF OVERTURNING FOR INDUSTRY AND THE INDIVIDUAL.—Not since the free silver craze of 1896 with its 16 to 1 formula, which was to become operative "without the consent of any other nation," has a national policy been urged upon the country with a tithe of the possibilities of chaos in business that are involved in the compulsory adoption of the metric system. What it would mean in matters affecting the everyday life of the average member of the community is suggested in the following, which is contributed to the current discussion by a well-known testing engineer:

WHAT THE METRIC SYSTEM WOULD MEAN IN SOME ORDINARY AFFAIRS

In domestic life:

Grocers' scales all require new poise weights, all notched balance beams scrapped and new ones provided, with new sliding weights.

Peck and bushel measures discarded.

Liter larger than a quart, new containers required.

Hectoliter, equal to 2.8 bushels, not a practical unit.

Prices on all commodities to be readjusted to new units.

In culinary matters:

All recipes to be readjusted to kilograms and liters; cook books to be rewritten; general confusion in kitchen operations.

New milk bottles.

In other household affairs:

Gas meters to be replaced by new system of units of volume, or readings of meters taken in one system and converted into the other, to avoid scrapping meters in use.

Water meters in same category as gas meters.

Tape measures and yardsticks to be discarded.

In shopping:

Counter measuring machines to be reconstructed, yards to meters.

Dry goods to be folded at cotton and woolen mills in meter folds instead of yard folds, requiring change of machinery.

Photographic plates in common sizes to be known by awkward combinations of figures. An 8 x 10 plate becomes 203 x 254 millimeters.

Quires and reams to be displaced by decimal multiples, requiring changes at manufacturing plants.

All containers and cartons to be modified in sizes and shapes to be adapted to new unit sizes.

Shirts, collars and cuffs to be known by strange names of sizes. A 16-inch collar becomes a 406-millimeter collar. A 187-millimeter hat is worn instead of 7⅜ inches.

In building materials and construction:

Abandon board measure and substitute square decimeters, centares or ares.

Doors familiar to all builders as 2 feet 6 inches by 6 feet 8 inches become 762 by 2,032 millimeters.

An ordinary brick is 51 x 101 x 203 millimeters. Sizes of sash also are converted into strange units. Weights of tin, terne, copper, zinc, lead sheets and plates placed before builders in unknown units, in awkward combinations.

Molds and pallets in brickyards to be changed to new units or inconvenient numbers used to represent sizes.

Earth excavation on basis of cubic meters, representing about 1.3 cubic yards. Designation of shovels and dippers in excavating machinery to be in fractions of cubic meters instead of definite yards.

All architects' drawings to be in new units, involving a most perplexing conversion of current building material units or made up on a system that will involve changes in all woodworking machinery to meet metric units.

In railroad affairs:

Change in position and renumbering of, say, 100,000 mileposts, an incidental and minor affair relative to other changes.

Standard gage of track becomes known as 1,435 millimeters.

Changes in time-table mileages.

Books of rules rewritten and speeds given in new units instead of miles per hour. Slow boards all repainted with new speeds thereon.

Speed recorders scrapped or remodeled.

Employees instructed in new methods of estimating speeds.

Dimensions of all wheels, axles, standard parts of car construction changed into new units.

Railroad track and warehouse scales to be reconstructed into metric units. Capacity of cars to be in new units.

In public land surveys:

Lands in many states surveyed and staked out in townships, sections, quarter sections and eighth sections, in none of which divisions is there an easy conversion into metric units.

In reconveyance of lands, present deeds giving metes and bounds in English units would require expensive and elaborate efforts to put dimensions and areas in metric units, which if correctly made would still be unintelligible to most people.

As great as the confusion in the few respects above mentioned and as expensive as the process would be in all the usual affairs of life, these few enumerated examples pale into insignificance beside the cost involved in making the conversion in the manufacturing industries. The cost of war is but a fraction of that which would confront the general industries of the country. Virtual scrapping of all small tools and fixtures would be faced by manufacturers were such an act of Congress passed.

A colossal fortune in changes of lead screws and screw-cutting gears, in lathes alone is involved.

In all machinery the changes become of such a staggering nature their mere contemplation is most depressing. Days would be required simply to state the number of changes involved in the industries.

The ravages of war have fixed and definite limits of territory. The ravages of the metric system changes would be universal in domestic affairs.

Compulsory legislation in this matter would plunge the nation into economic disorder, wiping out values in billions of dollars.

A dual system is confusing beyond description. Two systems do not admit of being in common use. A gradual change, piecemeal, is impracticable. A sudden sweeping change would throw the entire country into disorder.

In the chemical laboratory the metric system is used. It is there because it has advantages in chemical work. It was adopted because of its advantages there.

The metric system would be adopted by the industries if it possessed advantages for them.

The rewriting of all textbooks, engineers' tables, the changes in architects' drawings, in mechanical drawings, the education of the personnel of machine shops and other industries in the use of a new system of units are matters of greater magnitude than any yet undertaken by this country.

The Industrial Outlook

FROM *Mechanical World*, ENGLAND

THE prevailing conditions are not such as to bring peace of mind to the harassed manufacturer. It is a subject we wish we could keep away from, but it is impossible not to notice how manufacture is being artificially hampered at a time when all artificial barriers should ruthlessly be swept away, for there are other handicaps of a more less legitimate nature which call for all the resource and skill of the traders and manufacturers of the country to overcome. The unwise refusal of the molders as a body to accept the terms which their executive urged them to do must have one or two effects. It will either result in closing down more enginering works and so hit still further the funds of other unions, or the strike will peter out of itself by the simple process of some men going back to work and others following in increasing numbers. We believe this is what will happen, for when over seven thousand men are willing to go back to work, it will take very strong views on the principle of abiding by the majority decision to keep them out. A point which strikes us about the matter is that we are told there are fifty thousand union molders, and nothing like all that number voted, and it would be interesting to know the views of the remainder. Meanwhile, one large engineering firm has announced its decision to close down the whole of its works until the dispute is settled. On the other hand, the conditions generally are none too bright in regard to supplies of raw materials, having regard to the effect of the increased railway rates and threats of further labor trouble. Orders from overseas are coming over in increasing numbers, but manufacturers of iron and steel do not seem disposed to quote any prices, and the prospect of any further advances in the near future is causing considerable competition for the available supplies, which is tending to force prices up. The feature of the situation is that very little relief can be looked for from foreign supplies, for, contrary to anticipations, other possible countries are too busy making up their own arrears due to the war to be able to spare much in the shape of raw or semi-finished materials for export.

Heads Win

FROM *Power*.

THE other day on a street corner, I saw two little newsboys matching pennies. As I passed, one of them shouted, "Heads win!"

That little ragged urchin did not realize that he was proclaiming a great truth. But he was.

Time was when money was looked upon as being the chief factor in every branch of life. The capitalist was looked at with envy, and sometimes with fear. That day is fast passing away. People know differently now. It is headwork that wins today.

In the great world war it was not the money, the men, the tremendous amount of ammunition, the submarines, which won. It was brains. If the enemy produced a deadly gas, then the brains of the opposing forces were set to work to produce a gas more deadly than the other. When the submarines began to take their daily toll of ships sunk and destroyed, the allied nations realized that they must think out a way to get rid of these reptiles of the sea. And they did it. The magnificent brain of Foch and his generals planned a campaign which wore down the German hosts and in the end accomplished their defeat. Brains did it, not guns. Heads won!

In the industrial world it is not the man with the biggest muscles that gets to the top. It is not the man with massive arms and iron hands, who can lift a hundred-pound weight with ease, who gets the most money in the pay envelope at the end of the week.

It is the man whose brain is active, who thinks and plans and studies the best way to do a job. It is the man of power. And power does not mean brute force. Power comes from constructive thinking, cumulative thought or, in the parlance of the street, "using your head."

Men are beginning to think for themselves. The day when they were driven or led to do things by soft words and unctuous phrases has gone by. Today men in all branches of industry are fast thinking out their problems, without help from others. They are using their heads and they glory in it. Just in proportion as they learn to think for themselves will men grow in power to do and live and prosper.

The next time you hear a man grumble over the amount he gets in his pay envelope, tell him the story of the newsboy who unwittingly emphasized the great truth, "HEADS WIN!"

Reducing Spoiled Work

BY JOHN ADENDORFF,
Factory Manager, Brown-Lipe-Chapin Co., Syracuse, N. Y.

During the month of January, 1920, there were seven and one-half million mechanical operations performed on work in the Brown-Lipe-Chapin Company's plant. The average spoiled, wasted and defective material, per major operations, was 2.2 per cent. This 2.2 per cent does not refer to all of the minor operations included in the seven and one-half million figure, but does cover major operations as well as including defective and spoiled material.

A considerable amount of attention has been given to defective material, spoiled material, etc. in this plant. As to defective material, it is the policy of this company to have experts follow the sources of supply and inspect material, especially in the steel lines, before it is shipped from the mills. Very close inspection is also given at the forge plants. All raw material as it enters the company's plant is inspected. As soon as a machine operation is completed in the plant, it is the policy of this company to inspect the work immediately.

The individual operators have blueprints from which they take their dimensions. Each operator is held responsible for his own work. A set-up man in each group of machines, as well as the gang boss, is also held responsible for the work coming off the machines.

A System Instituted, Employing Machine Inspectors

When our spoilage was excessive we instituted a system of employing machine inspectors; that is, putting an individual inspector in charge of the work coming from a group of machines. This inspector would circle around the machines and inspect as many pieces as he had time for. We believe that through this method many improvements were made, and it has lately been possible for us to withdraw these machine inspectors in all cases, except that of inspecting finished teeth of gears. In this case we still employ a machine inspector for each group of machines. We find that it is good practice to inspect work continuously as it is completed. The "moveman" circulates around the different groups of machines and picks up whatever piece or pieces there may be around each machine and carries same to the inspection bench for inspection.

To improve the status of inspectors, regular classes were held by a competent instructor. Inspectors received instruction as to proper knowledge of reading blue prints, skilled handling of micrometers, vernier calipers and other tools used by them. Also a knowledge of the product, more especially the reason why close limits were held in certain dimensions and limits not so close in other dimensions. In these classes the inspectors were impressed with the importance of their duties and were instructed to report all faulty dimensions, no matter who the operator was that produced such work. As the inspectors became more competent their wages have been increased accordingly.

In Some Departments Operators Are Not Paid For Spoiled Work

In some departments we do not pay operators for work spoiled, even though we have repair men who can repair such work. We are working toward the object of establishing this principle throughout the factory. Written inspection reports are obtained daily and closely watched by certain executives of the company. As soon as the spoilage exceeds a given figure, steps are taken to immediately remedy the condition.

It has been our experience that the condition of the operator's machine, as well as the tooling, has a great deal to do with wastage and spoilage.

We also believe that the conditions surrounding the operator, especially atmospheric conditions, have a great deal to do with spoilage and wastage. We are now working toward the end where we can get a complete circulation of fresh air into each department every fifteen minutes, or at least every half hour.

A Step Toward Accident Prevention in Massachusetts

On March 9, 10 and 11, the first annual Massachusetts Accident Prevention Congress was held at Worcester, Mass., under the joint auspices of the Worcester, Springfield and Boston locals of the National Safety Council and of the Associated Industries of Massachusetts. The convention was adjudged a decided success in every way. The attendance was good, over 250 registering at the Hotel Bancroft, which served as headquarters. The various phases of industrial accidents and their prevention were well covered by competent speakers, so that the character of the proceedings was chiefly of an instructive nature.

Probably the most important work of the congress was the action taken toward the establishment of a hospital and vocational school for the care and education of serious disability cases. Worcester was selected as the preferred site, and efforts are to be made to interest the state in the building of such an institution there.

In the event that Massachusetts does not take action upon this matter, it is possible, and even probable, that insurance companies and industrial concerns will found and support the institution without the aid of the state.

The first day of the convention was devoted to topics of a rather general nature, the initial session opening with a luncheon. The first speaker was C. W. Price, who is the general manager of the National Safety Council, Chicago. In his opening statements, Mr. Price said that, while the Government reports show that 47,949 of our soldiers were killed in Europe during the 19 months that we were engaged there, 126,000 people were killed in this country during the same period of time and 35,000 of these were killed in industry itself. Among the statements of Mr. Price that were worthy of especial note are the four facts which follow:

First: That it has been demonstrated in actual practice that three-fourths of all deaths and serious injuries in industry can be eliminated if the manufacturer so desires.

Second: That the safety movement offers the first common ground where employer and employee can meet for mutual benefit.

Third: That the reduction of serious and fatal accidents which has been accomplished so far has been due only one-half as much to the introduction of mechanical devices as to the reaching of the foremen with the safety idea and to the subsequent passing of it to the men.

Fourth: That the safety work can be looked upon as profitable business, because big dividends are paid upon the investment.

The rest of the session was taken up by addresses given by J. F. Ginsley, vice president and general manager of the Crompton and Knowles Loom Works, Worcester; by D. S. Beyer, vice president of the Liberty Mutual Insurance Co., and by W. Hall of the Wickwire-Spencer Steel Corporation. In the evening, entertainment was provided by moving pictures dealing with safety-first principles and by a Court of Inquiry on Accidents which was acted by the permanent Safety Committee of the American Steel and Wire Co., of Worcester.

The morning of the second day of the congress was devoted to a surgical session, the chief speakers being W. I. Clark, Service Director of the Norton Co., of Worcester. Mr. Clark's subject was Fractures in Industry. D. M. Holman, manager of the United States Mutual Liability Insurance Co., at Quincy, Mass., talked on the Rehabilitation of the Handicapped Men. In the afternoon, a session was devoted to the influence of the house organ in promoting the safety-first movement followed by an inspection of several of Worcester's chief machine plants. In the evening a session of especial interest to foremen was held, the importance of the foreman in preventing accidents being well brought out.

The morning session of the third day was occupied by addresses by representatives of insurance companies on the means of safeguarding employees. The principal speakers were F. H. Wentworth, secretary of the National Fire Protective Association, Boston, and William Ferguson of the Travelers' Insurance Co., Hartford, Conn. In the afternoon session R. M. Little, director of the Safety Institute of America, New York, gave figures upon the number of industrial accidents and upon their cost. Among the other speakers of especial importance were V. T. Noonan, of the Bethlehem Shipbuilding Corporation, Quincy, Mass.; W. W. Kennard of the Massachusetts Industrial Accident Boards, Boston; J. P. Meade, of Boston, and A. L. Powell, of the Edison Lamp Works, Harrison, N. J.

The resolution supporting the foundation of a rehabilitation hospital and training school was drawn up and adopted.

The congress ended with a banquet, the chief speaker being Channing Cox, Lieutenant-Governor of Massachusetts, who commended the congress for the task it had undertaken. The session was closed with an address by H. L. Smith, general manager of the Bethlehem Shipbuilding Corporation, who reviewed the work done by the congress and urged co-operation in the great work that it had begun.

The International, or Supernational, Organization

By W. Osborne

A number of men were unloading sand. They were over on the back track out of sight and were improving the opportunity by having a little talk among themselves.

"Did any of you fellows hear that chap who was talking up on the corner last night? He was some talker, now, I tell you. If we all got what we earn we would not be shoveling sand here, and that's a fact. He knew how to show them fellows up who make us pay rent, and interest and all that sort of thing. He said that us fellows are just a lot of jackasses that are working along more than half asleep, and he is trying to wake us up so that we will reach out and take what is coming to us. You bet I went up and chipped into his hat without being asked to."

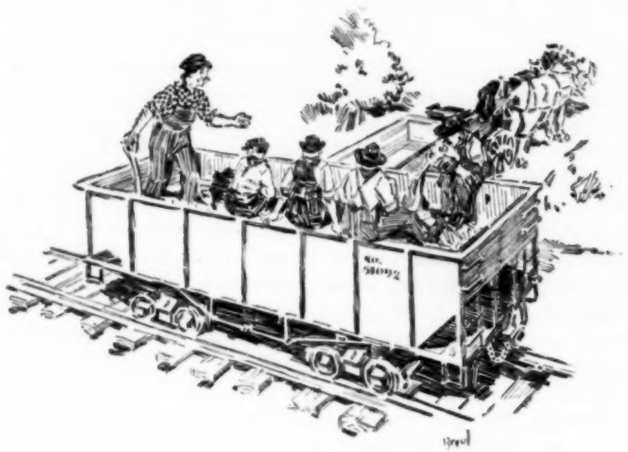
The speaker leaned on his shovel while he waited for signs of how his words had been received.

"Did he mean," said an old man, "that the bank shouldn't ought to give me any interest on the money I got in there in a savings' account? When my old woman died and I sold the farm the man who bought it didn't have all the money and I took a mortgage for what he didn't have. He pays me six per cent on that mortgage. Did that fellow last night mean that the man who bought my farm shouldn't pay me any interest?"

"He ought to be able to get the money from the Government so he could pay you for the farm," said the first speaker.

"When work played out in our town and I came here I rented my house back there. According to that bird who was talking last night, who you have been telling about, I shouldn't get any rent. Don't I have to pay taxes, and didn't I have to save up my money and build the house and isn't it getting run down all the time with them people living in it and not taking any kind of care of it?" Evidently this speaker was a capitalist.

"You hadn't ought to had to build a house. The Gov-



ernment had ought to build it," said the first speaker, "and then you shouldn't need to be worrying about rent."

"Where is the Government a going to get all of this money, I'd like to know? Maybe some of you fellows never pay any taxes; or anyhow maybe you think you don't because you don't own any property, but let me tell you somebody has to work for every cent that the Government either uses or wastes. You don't need to talk to me. The only thing you get for nothing is to get it in the neck. Lookey here, now, ain't we getting more money than we ever did, and ain't we able to buy less for it than we ever did, and ain't the Government spending a lot of money for things that it never did before, and ain't everybody blaming everybody else for being to blame for the high cost of living, and—"

The speaker was getting warmed up to his subject and there is no telling where he would have ended had not a fellow, who up to this time had not spoken, broke into the discussion.

A Mysterious Speaker

"See here now," he urged in a mysterious manner, as he held up his hand for attention, and looked around so as to be sure that he would not be overheard by any outsider. He motioned for them all to gather closely around. Evidently he had something of importance to disclose. Lowering his voice until it was not much above a whisper he continued. "You knew that last young fellow that the company took on? I mean that good-natured one that is always trying to jolly a fellow. Well, he was trying it with me the other day and I just let him keep at it to see what he would say, and he let something drop

that I don't think that he meant to let drop. Do you know why them kind of fellows have it on us? Well, sir, I can tell you. They all belong to some kind of an organization that has a lot of laws. Every one of them has to obey these laws and so they all work together for each other. Of course there was a lot of it that I didn't get, but it is, so he says, the strongest organization in the world.

"He says that it is a bigger thing than the Masons, or the Knights of Columbus, or Lenine and Trotsky or any of them things, and that these laws of their's are worked on you whether you like it or not. Why, he says that they have knocked out business men, and big corporations, and even governments that would not join with them. He said that these laws can't be changed by anyone, but that if you buck against them they just up and get you in one way or another. Some funny things he said. He said that there was a lot of different degrees that you could take, and that nobody got to where they had all of them, but that if you wanted to know the laws of any of them the ones who had taken them would tell you what they were, or what you had better do.

Every Educated Man a Member

"He said that every educated man was a member of this organization and had some of the degrees. The way he talks it seems most of the trouble in the world comes from two things. One is that a lot of fellows like us are trying to do things without knowing anything about this organization and its laws, and are balling things up; and the other is that a lot of fellows, who are in, are trying to do a lot of things that are under laws where they have never taken their degrees. Just like this, you know, where men try to make laws in Congress that can't be made.

"I told him right there that Congress could make any kind of a law that it wanted to (that is, if the President would sign it, it would be a law), and he laughed and said, 'I guess you never heard of the congressman who moved to repeal the law of gravity, did you?'

"I can't understand about this organization and its laws and how it is that I never heard of it before, but I'll be darned if I don't think that there is something in it; for else why would we fellows all be out here shoveling sand while them educated fellows are having the easy time of it in shops, and stores, and banks and such places."

What the Farmer Said

Said the old man who had once owned a farm: "I don't know whether or not that fellow was stuffing you about that powerful organization and its wonderful laws, but I am almighty sure that if we do not mind the law that applies to getting sand out of a car by moving our shovels faster than we have been doing the boss will come around pretty soon and we will have to see how we can work the law of hunting for other jobs."

"It's fellows like you that are scared of the boss that helps him put it all over us. You ought to have heard that fellow last night," said the fellow who had started the talk. "He could tell you some things."

"Maybe he could, maybe he could," muttered the old man, "but out on the farm I never got no potatoes planted by setting in the shade, a whittlin' and a cussin' of the neighbors who had better crops than I had." With that he began throwing out the sand as though he was working for himself back on the farm.

Why One City Failed to Pass a Localized Daylight-Saving Law

By Frank H. Williams

In Fort Wayne, Ind., the proposition of passing a local daylight-saving law was thrashed out extensively—a voting campaign on the proposition being conducted by one of the newspapers, and all sorts of organizations meeting and registering their opinion regarding the proposition. As the result of this thrashing-out process the city council voted not to pass a daylight-saving bill for Fort Wayne. When the bill was originally introduced all the councilmen were in favor of it. The reason for the change in attitude was due to the widespread opposition to the bill among all classes—employers and employees, manufacturers, office people and store owners and workers.

Believing that the reasons for the failure of the bill to pass in Fort Wayne have been more clearly summarized than in most cities where the daylight-saving law has not been put into force, a little information regarding the reasons will be given for the purpose of showing just how widespread and general the opposition to daylight saving is in this locality.

Employees generally, in letters to the newspapers and in their meetings, declared that their opposition to the bill was based on the fact that it is much easier in the summer time to get refreshing sleep in the early hours of the morning than it is in the hot hours of the earlier part of the night. They further declared that daylight saving simply meant for them that they must get up earlier, lose this refreshing sleep and go to bed later at night than formerly because everyone knows that under the daylight-saving law it is really only 11 o'clock at night when the clock says 12 o'clock and that, therefore, people as a rule go to bed at the same time as usual under daylight saving no matter what the clocks say. They further stated that this had the effect of making them lose an hour's sleep.

The opposition of the manufacturers to the bill was based on the fact that with a daylight-saving law, the time in Fort Wayne would be different from that of the railroads and the surrounding towns and that consequently, shipping schedules would be confused and there would be constant trouble and fussing over trying to make town time agree with railroad time and with the time of surrounding towns. They also said that as the mails would arrive in Fort Wayne at the usual time and that with Fort Wayne saving an hour of daylight it would make the delivery of the mails seem to be an hour late, thereby having the effect of cutting an hour's time off the day's work.

The opposition of store and office employees was equally positive. The majority declared emphatically that an extra hour of daylight meant nothing to them and that they much preferred sleeping an hour later in the morning to arising an hour earlier and having an extra hour of sunlight in the afternoon.

Farmers, of course, were very greatly opposed to it, as were drivers of milk wagons, bakery wagons, etc.

The opponents of the bill also claimed that the only ones in favor of it were automobilists and golf players who wanted to stop work an hour earlier so they go riding or play golf. The very extensive opposition to the bill was a surprise to the councilmen—the opposition of the manufacturers being particularly surprising.

American Commercial Association Advocates Trade with Russia

Over one hundred prominent business men, manufacturers and exporters gathered together at the Hotel Astor last Wednesday at the second meeting of the American Commercial Association. This association was organized last February for the purpose of taking united action in prevailing upon the government to open up trade relations with Soviet Russia, so that American business and American industry might enjoy some of the great opportunities which that country holds forth in the commercial world.

The meeting was opened by a few introductory remarks from the president, Emerson P. Jennings, president of the Lehigh Machine Co., of Lehighton, Pa. Mr. Jennings spoke briefly of the purposes of the association and of the efforts made so far to further this end. He said that England, France and other European countries were trading with Russia and that if the United States government persisted in ignoring this new republic, the commerce of this wealthy country would be soon swallowed up by foreign competitors. He declared that the recent supposed exchanges of war prisoners between England and Russia were nothing more than "trade missions, thinly disguised."

Eugene Schoen, general manager of the International Oxygen Co. of Newark, N. J., was the next speaker. Mr. Schoen was a member of the committee from the association, which went to Washington on two different occasions, to urge the State Department to take some action in this matter. He told of the difficulties encountered in getting an interview with anyone who knew anything about this condition and said that the committee found absolute ignorance in the State Department on Russian affairs. He said that the committee was informed that the Kolchak government was the proper one to deal with, but since Kolchak had been dead several weeks, it would be quite difficult to do business with him. "Russia is potentially the greatest open market in the world to day," he said. "Congress, the State Department and all other official bodies are willing and anxious to resume trade relations with Russia. The only power that stands in the way is the President. But the United States will be compelled to recognize Russia in a short time, for those who owe us millions of dollars need Russia's export and import trade in order to pay their debts.

Soviet Representative Speaks

What was probably the most important address of the session was delivered by Santeri Nuorteva, secretary of the Russian Soviet Bureau. Mr. Nuorteva gave a short history of the activities of the Bureau since its appearance in this country over two years ago. "Russia," he said, "wants to establish trade relations with the United States more than with any other country in the world, because you are the only country not interested in European politics and your economic interest does not lie in political and commercial exploitation of European countries. And the United States is better equipped to supply the needs of Russia at the present time. Russia, after six years of war and revolution, is stripped bare of all the ordinary necessities of life. During the reign of the Czar the people did not know the use of the simplest things; but now that they rule they want these things, and if trade relations are opened, Russia will absorb all that American industry can produce and ship. The Russian Soviet government has $575,000,000 in gold to spend in the American market and can readily pay for what it needs."

Don't Want Diplomatic Privileges

Mr. Nuorteva declared that the Soviet Bureau in Washington was not looking for diplomatic privileges, salutations or social recognition, but was merely interested in establishing friendly commercial relations with our government. He said that all the investigations to which the bureau has been submited, have brought no proof that it has been disloyal to the United States. In conclusion he said, "Russian trade is now at a very critical point. Are realtions possible and practicable at this time? Russia holds unceasing regard for America, she has the money and everything needed to establish trade with you if given the chance to develop her commercial and economic life."

Before the meeting adjourned the members authorized the president to appoint a committee to draw up a set of resolutions calling upon the government to open up trade relations with Russia. These resolutions will be in the form of petitions and will be circulated around the country to be signed by men interested in this movement. They will then be forwarded to the State Department at Washington in the hope of prompting official action.

American Can Company to Hold Large Auction

Large quantities of metal working machinery, electrical equipment, tanks, conveyors, other machnery, small tools, general factory equipment and general stores and materials will be sold at public auction by the American Can Co., which is eliminating its war equipment.

Thirty-one buildings, from small frame to large steel structural, will also be sold, dismantled and removed. The 133-ft. twin-screw steamer "Nassau" is included in the auction. It is 400 tons gross and has a capacity of 750 passengers.

The sales will take place on April 27, 28, 29, 30 and May 1 as follows:

Geneva, N. Y., April 27—Motors, testing machine, presses, lathes, grinding machines, heat-treating furnaces, tool steel and various other machinery and equipment.

Kenilworth, N. J., April 28-29—assembling machines, paper cutting machines, etc.

Edgewater, N. J., April 29, 30 and May 1—750 metal working machine tools, 100 power presses, electrical equipment and motors, furnaces, etc. The buildings and steamer will be sold May 1 at 1 p.m.

An inspection can be made at all plants from April 19 up to the days of sales. For further information apply to the American Can Co., 120 Broadway, New York.

Machine Tool Exports in February

Metal working machinery valued at $3,769,161 was exported during February, according to figures just compiled by the Bureau of Foreign and Domestic Commerce. This compares with exports valued at $6,400,717, for the corresponding month of 1919. The exports of February, 1920, were made up as follows: Lathes, $587,348; other machine tools, $895,675; sharpening and grinding machines, $261,209; all other metal working machines, $2,024,929.

The principal exports were to France, which took $1,105,955. The United Kingdom was in second place, taking the metal working machinery to the extent of $482,845. Exports to Canada were $435,436; to Spain, $229,131; to Japan, $156,785; to Belgium, $149,151; to Italy, $147,673; to Cuba, $115,836. The exports of metal working machinery for the eight months ending with February, aggregated $32,415,882. This shows a slight decrease over the corresponding periods of 1918 and 1919 when exports were $40,547,436 and $35,004,408, respectively.

While in February of 1919 imports of machine tools were valued at only $355, imports increased until in February, 1920, they were valued at $38,410. The total imports for the eight months ending with February were 1,229 machine tools valued at $180,964.

Ralph G. Macy Elected Vice-President of Engineering and Appraisal Co.

The Engineering and Appraisal Co., Inc., of 103 Park Ave., New York, announces the addition to its engineering staff of Ralph G. Macy, who has been elected vice-president of the company. Mr. Macy has resigned his position with Walter Kidde Co., where, as chief engineer of the construction department, he has made a remarkable record for personal ability and energy in organizing local working forces and carrying on important factory construction in various cities simultaneously.

Mr. Macy has to his credit a long experience in engineering and industrial work. When the United States entered the World War he was at once granted a commission in the Army and ordered to Aberdeen Proving Grounds and almost immediately was detached and sent to Fort Worth, Tex., to construct from start to finish the first helium gas-plant establishment of the war. Upon the completion of this plant, he returned to Aberdeen as ordnance proof officer, and was then sent to Sandy Hook as armament officer in the Coast defense.

Mr. Macy has been a resident of New York City since 1910, and engaged successively in the construction or operation of gas work, power plants, underground caisson work, under compressed air, and high-tension electrical distributing systems and sub-stations. In 1914 and 1915, he was in charge of maintenance and distribution of the gas-works system supplying the west side of Manhattan.

Some Do's and Don'ts That Will Help in Foreign Trade

An interesting feature of the meeting at Lakewood, N. J., of the members of the Association of National Advertisers was the address of J. B. Benson, chairman of the Association's Export Committee. In the course of his remarks, Mr. Benson gave the following list of "Do's" and Don'ts," which will be appreciated by all who have served a foreign trade apprenticeship:

The Do's and Dont's

(1) Don't attempt foreign trade unless you expect to stick; analyze the market before you start. Build on known facts, not hunches.

(2) Don't think of a foreign market as a dumping ground, an outlet for left-overs and "seconds."

(3) Don't go into foreign trade just to fill in—a temporary expedient—if you start with a customer, stand by him.

(4) If takes time to develop profitable foreign trade—unless the exporter is willing to so build, he had best keep out of it.

(5) Careful planning and consistent, intelligent effort have developed the big foreign trade of England, Germany and France—haphazard tactics can develop nothing but disappointments and ultimate failure.

(6) The American manufacturer who has made a success of his domestic business owes it to a thorough knowledge of his market, the tastes and peculiarities of the potential users of his product, the use of merchandising methods that fit definite, known conditions, and a broad vision. He can make the same success in foreign fields if he plans as carefully.

(7) Put yourself in your customer's place. First see the foreign buyer's side of it, then educate him to see yours. Change his tastes by education, not by force.

(8) The first order is merely an opener—it takes repeat orders to build a profitable foreign business.

(9) Be explicit in specifications, prices, terms—don't leave anything to the imagination of the other fellow.

(10) Don't abuse your customer's confidence. He expects you to send exectly what he orders, not a substitute, and to send no more or less than he orders. He expects you to fill at the prices you quoted, to pack and ship exactly as he instructs.

(11) Follow your customer's instructions explicitly. He has learned by experience what is essential and necessary. You may be thinking in terms of a through shipment and delivery at the dock. Your customer is thinking in terms of a through shipment and deover land on mule back.

(12) A satisfied customer is your biggest asset here at home—it's no different in a foreign country.

(13) Don't stop when you've put your goods upon the importer's shelves—help take them off, just as you would do with a retailer in this country.

(14) Don't over-sell the importer or induce him to stock goods that don't fit the market.

(15) Don't jump at the selection of the importing house you appoint as resident agent—know that he means business, that he is going to push your goods and not throttle them.

(16) Just because a man speaks the language of the country does not mean that he is the type of man fit to represent your concern as a salesman. Your house is judged by your representative.

(17) Diplomacy in a man is a bigger asset than speed.

(18) Don't forget the little things—they probably big things to your foreign customer.

(19) Allow enough in your foreign selling prices to include ample and constructive merchandising help.

(20) Know that your promotion matter fits conditions and is acceptable to your foreign representative. Work far enough ahead to get your customer's point of view.

(21) Take care in selecting the one who translates your cataloges. There's a difference between a catalog that is "transposed" and one that is "translated."

(22) Answer your correspondence in the language of his country and don't make your letter too short or curt.

Drive for 32 Hours

The Standard Steel and Bearings Co., Plainville, Conn., has adopted the use of automobile trucks to convey material to and from the plant to distant cities. Ernest Johnson and Clifford Lee made a trip to Philadelphia last week with a six-ton load of steel, making the trip in 32 hours, driving steadily during that time.

LD'S INDUSTRIAL FORGE

News Editor

English Trade Letter

(From Our London Correspondent)

March 26, 1920.

One of the most notable features in the commercial world of late has been the relative failure of appeals by new manufacturing and other companies to the money market. It would appear that for the time being investors are getting more cautious; perhaps they are actually reading the prospectuses put before them.

The importance of increased production to the prosperity of Great Britain has been recognized by the government, and committees will be established to make inquiries. The committees are "to consider and advise as to the best means of securing the greatest possible production consistent with the permanent well-being of industry and of the employers and employees engaged therein."

A decimal coinage for Great Britain has been definitely rejected in the majority report issued by the committee appointed in 1918 to consider the subject. It is admitted that generally speaking, the prevalent public attitude is indifference. The report suggests that many of the witnesses expected the decimalization of weights and measures to follow that of the coinage, but they reject this and say "we find, on the other hand, that the existing system is regarded as admirably suited to the needs of everyday life."

Iron and Steel

In iron and steel market conditions no change can be reported. London once more has noted offers from Germany and Belgium. It is understood that American billets, too, may be offered, the prices being somewhat below those current in Great Britain. Recent advances here in fact, have had the effect of rendering buyers cautious. This has been noted particularly as to foreign inquirers. The considerable reduction in Indian galvanized sheet, namely £18 a ton, had a somewhat depressing effect recently; but for the most part there is little decline in prices. Turning to machine tools in particular, as the result of wage advances almost due, arrangements are being made to increase prices to correspond.

Engineering firms, of course, depend very directly on the supply of raw material and the larger firms have of late been acquiring interests in steel and other firms. Thus, D. Colville & Sons, Ltd., Motherwell, has been joined to Harland & Wolff, Ltd., the well-known shipbuilder and internal-combustion-engine manufacturer, etc.; while the Steel Co. of Scotland Ltd., has been acquired for about 1¾ million pounds by a syndicate of Clyde shipbuilders and others. Then the recent purchase of Pearson & Knowles shares by Armstrong, Whitworth & Co., Ltd., was for the purpose of putting the engineering firm in control of important supplies of raw materials. The latest move of Armstrong Whitworth, in fact, is to add civil engineering and public works contracting on a large scale to its other enterprises, a civil engineering department, it is announced, having been formed under the control of R. H. Mackenzie.

A Firm Whose Hourly Output Has Not Decreased

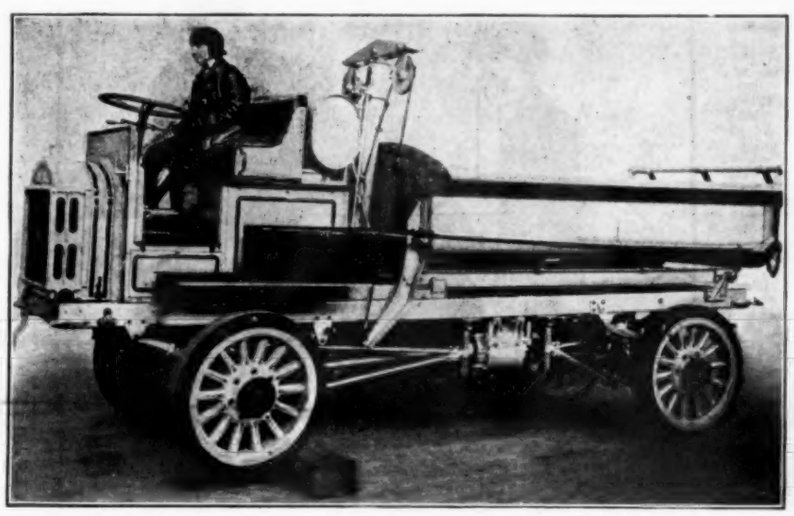
The writer recently visited a works, about fifty miles from London, which was devoted to the manufacture of a single type of machine tool, and was perhaps a little surprised to learn that the hourly output was about equivalent to that of pre-war days. Of course, the weekly output is not the same, the 47-hr. week being worked instead of the 53-hr., while now no overtime working is permitted by the operatives. The works employs about 100 workers and essentially forms one large room so that they are easily overlooked. If a machining job seems to be taking a time markedly longer than was usual in the past the reason is investigated, and, where necessary, a new process is devised and put into operation; but not by the same man. The work is moved to another section of the building. Erectors work on a bonus plan and if they do not earn a bonus, are discharged; or rather the threat of discharge has in the past been enough.

One result of the molders' strike which might possibly not have been expected is that this firm has had to extend its lines of manufacture. Before the war the firm was gradually eliminating sizes and types, and during the war, being under government control, was practically compelled to manufacture but two machines in quantities. This policy would have been continued and, in fact, it may be that in the future machines of but one type and size will be produced. Unfortunately, in the course of the molders' strike the stock of castings was almost used up and obviously with resumption of work the foundries have an overwhelming demand. In order to get a sufficient quantity of castings to keep the whole working force going, the firm therefore used existing patterns, thus getting supplies from several sources. In this way it has been forced into the production of tools of several types which otherwise would have been completely dropped.

Alfred Herbert, Ltd., which has long given special attention to the export of its machine tools, has for a considerable period been running a journal which, nominally monthly, comes out as circumstances may dictate. Its rival in overseas trade—namely, the Associated British Machine Tool Makers, Ltd.—is now also issuing a monthly journal.

Watt's Heathfield Hall

Heathfield Hall, which was built for Watt and to which he moved in 1790, may possibly be purchased by the Birmingham municipality. It was of course visited last September by a number of engineers on the occasion of the centenary of the death of Watt. The hall has for many years been occupied by George Tangye, but is the property of Major J. Gibson Watt, a grand-nephew of the first occupier, and he has made an offer which is under consideration. The building and grounds (about 40 acres) will be sold, but the relics, being heirlooms, will be on loan, provided they are kept at the ha"



Miss Luella Bates, who learned all about trucks, doing a man's work during the war at the Four Wheel Drive Auto Co., Clintonville, Wis., shows how thoroughly she has mastered this three-ton FWD truck. She is holding the front wheels less than two inches from the ground with foot brake only, which is effective on all four wheels. The foot brake is located on a bracket attached to the cross-member, directly in the rear of the transmission.

The Lakewood Engineering Co., Cleveland, Ohio, has announced that Clarence I. McNair of the Northwest Paper Co., was awarded the first prize of its contest for the best treatise on industrial haulage, using the Lakewood Tier-Lift Trucks. The prize was $1,000; a second prize of $500 and a third of $250 were also awarded. F. C. Peters and G. R. Reese, New Jersey Zinc Co., won the second prize, and T. M. Prudden, Whitin Machine Works, won the third.

Trade Currents from New York and Chicago

New York Letter

In common with most other lines of business, the machine-tool industry has suffered severely as a result of the railroad strikes. The teamsters' strike, that was declared on the sixth day of the railroaders' walk out, made an already bad situation much worse. It was next to impossible for New York machine-tool dealers to get shipments from the outside, and rail deliveries were out of the question.

Various means were resorted to in order to overcome the difficulties that have presented themselves during the past week. Much business has been transacted by telegraph, and long-distance 'phone on account of the uncertainties of the mail service. One concern has resorted to the expedient of dispatching motor trucks to Cincinnati for a consignment of tools, and another firm has chartered a special steamer to get deliveries from the factories that it represents along Long Island Sound.

The quiet of the past few weeks continues through the present writing. The only list of note that appeared in local dealers' offices this week was that of Shuttleworth Brothers of Amsterdam, N. Y., who have inquiries out for about twenty tools. It is rumored that the Erie is shortly to put out a good sized list, but the present labor difficulties besetting this corporation is likely to delay definite action for the present at least.

The Willys-Knight interests were inquirers during the week for a limited list of small tools for their Poughkeepsie plant, and the American Chain Co., of Bridgeport, had a list out for about eight presses and drop hammers. Western mining interests were represented in the current inquiries by a short list from the Shattuck-Arizona Copper Co., of Bisbee, Arizona, which is asking quotations on several drill presses and lathes.

Chicago Letter

New orders continue to be booked by the trade at the pace set some four or five weeks ago—considerably less in volume than that recorded in January and February but sufficient to render excellent business. Steady production by all manufacturers keeps the total of goods shipped slightly in excess of orders placed and the aggregate back orders on dealers' files is shrinking slightly. The present transportation tie-up resultant from the "outlaw" strike is now less serious here than in the East and has not caused sufficient derangement of affairs to seriously affect either production or delivery.

A review of production schedules shows that, in general deliveries are now no worse than they were a couple of months ago, and in some cases are even better. Various dealers are promising deliveries as follows: Ordinary capacity boring mills can not be had until late this fall and heavy machines are being scheduled for 1921. Multiple-spindle drills are even worse, eight to nine months being required by most builders. Planing machines require five or six months, gear hobbers the same and most types of milling machines take about three months. All styles of lathes continue in heavy demand. Medium pattern lathes can be obtained in two months but heavy-duty lathes require from three to four. Heavy-duty drills can be had in from two to three months as also can punch presses. Light toolroom equipment can be supplied in sixty days or less and grinding and shaping machines in from thirty days to two months.

Quotations and delivery prices on one make of keyseating machine have been withdrawn, as is also the case with some makes of pipe threading machines. On this latter item the most recently quoted deliveries ran into November and December.

The largest single inquiry received in some time is being made by the Chicago, Burlington and Quincy Railroad. The list embraces up-

wards of $300,000 of miscellaneous equipment, engine lathes being the most prominent item in point of numbers. Aside from this, the heaviest buying factor is the agricultural implement industry, several manufacturers being in the market.

Dealers in parts and machine supplies report good business. As the deliveries of tools continue the consumption of supplies should reach and maintain a high figure. The only threatening indication in this field is the extreme difficulty of securing raw materials, due to rail troubles.

A Telephone Development

A development in telephony which has a very wide scope for industrial uses in conditions where there is considerable noise is due to the requirements of our airmen during the war. Incidently it has the inestimable advantage of being immeasurably more hygienic than the present telephone transmitter. Conversation during the early stages of the war between pilot and observer was mainly by hitting each other on the back, or by means of written messages. The speaking tube followed, and then came the telephone on the ordinary principle of shouting into the receiver, such as we are all familiar with. This problem of transmitting speech in an airplane in flight was not an easy one, for not only had engine noises to be overcome, but other difficulties of a purely telephonic nature imposed themselves. The Post Office authorities took the matter up, and Captain Cohen, an old National Telephone Co. officer now with the Post Office, hit upon an ingenious plan which has all the possibilities of being extremely useful under other conditions than those prevailing in an airplane. In short, a combined transmitter and receiver is employed, but the usual mouthpiece is eliminated in favor of a transmitting device which fits against the larynx. Using this device and speaking in an ordinary tone in the midst of the most deafening noises, speech is transmitted in the clearest possible manner, the effect being produced by the vibrations of the throat of the person speaking. The complete effectiveness of this instrument under aircraft conditions—it has been tested satisfactorily—with 400-hp. Liberty engines running at full blast—suggests that it would be a boon in engine rooms and similar places where there is always noise and where it is usually necessary to shout at the top of one's voice in order to be heard. It also has great sanitary properties from the standpoint of the public telephone which, however, is another matter.—**Mechanical World.**

Director's Meeting of the Material Handlers' Association

The directors' meeting of the Material Handling Machinery Manufacturers' Association of New York was held in that city on April 6. Charles F. Lang, president of the Lakewood Engineering Co., of Cleveland, was elected president and Rumsey W. Scott, of the Otis Elevator Co., of New York, was elected vice president.

Three new companies were added to the membership rolls and two men who have been active in the organization of the association were elected to honorary membership. A general discussion of present-day labor problems, high wages and the demand for increased production brought out some very good suggestions from those present.

The subject of material handling was also gone into and several new and interesting points were brought out.

U. S. Machine Tools Get Business in Java

American machine tools are rapidly gaining an enviable reputation in this market. One of the largest and most successful machine shops in Soerabaya is completely equipped with modern American machine tools and is securing an abundance of orders for shopwork which, it appears, it is able to fill more satisfactorily than any of its competitors. It is announced that this concern has recently been awarded the contract for the iron and steel work of a new government railway terminal at Tandjong Priok, the port of Batavia. This speaks well for the Soerabava shop, with its American equipment, in view of the competition of Batavia firms located so much nearer the work.

Europe Reduced Purchases Here in February

American exports to Europe during February, reported by the Department of Commerce as valued at $384,661,000, were only $10,500,000 greater than in February of last year and were less by $83,525,000 than in January, 1920, whereas the decline in the total of export business of the country as compared with that month was $86,976,000. February imports from Europe registered a gain of about 250 per cent over the same month of last year, being reported at $106,743,000, against $30,020,000, but showed a drop from $112,030,000 in January. The excess of exports in the trade with Europe during February was $277,918,000, against $356,156,000 in January and $344,038,000 a year ago. On this basis the showing is regarded as more favorable than for either of the months with which comparisons are made.

A feature of the month's returns is the further expansion in the export trade to Germany, much of which is understood to be financed through the marketing in this country of German municipal bonds. The value of exports to Germany during February was $18,598,000, an advance from $14,675,000 in January. Imports, on the other hand, declined from $4,385,000 in the first month of the year to $3,881,000 last month. The ban on trade with the enemy had not been lifted a year ago so that there was no commerce with Germany in February, 1919.

The Four Principal Countries

The bulk of American export to Europe continues to be taken by the four principal countries of the Allied group, Belgium, France, Italy and the United Kingdom, the latter accounting for a greater share of the total during February than any other nation or than any grand territorial division excepting Europe. The exports to this group dropped sharply as compared with February, 1919, and even more sharply as compared with January, being valued at only $289,190,000. In the case of France and Italy, shipments were smaller than in February, 1919, as well as in January, while exports to Belgium were approximately the same as a year ago. Exports to the United Kingdom were less than in January but almost $3,000,000 greater than in February, 1919. The declines from the January figures are attributed to the break in exchange and the shorter month. Imports for the group were valued at $75,485,000, off somewhat from January, but almost 300 per cent higher than in February, 1919.

National Safety Engineering Section's Spring Conference

A number of the engineers who are foremost in accident prevention work and in engineering education are on the program of the first spring meeting of the Engineering Section, National Safety Council, to be held in the Engineering Societies Building in New York City on April 27. The relation between safety and engineering and the engineer's place in the modern industrial world will constitute the motif of the entire program. C. P. Tolman, Chairman, Manufacturing Committee, National Lead Co., and Chairman of the Engineering Section will preside.

The detailed program follows:

MORNING SESSION

10 A. M.

The Relation of Safety to Engineering Efficiency—L. A. DeBlois, Manager, Safety Section, E. I. du Pont de Nemours & Co., Wilmington, Del.

Discussion opened by—F. P. Sinn, Assistant to the Vice President, New Jersey Zinc Company.

Safety Instruction in Engineering Colleges. "The University of Illinois Plan"—Paper by Bruce W. Benedict, Manager of Shop Laboratories, University of Illinois.

How to Interest Student Engineers in Safety—Professor G. S. Blessing, Department of Engineering, Swarthmore College, Swarthmore, Pa.

AFTERNOON SESSION

2 P. M.

General Subject: Safety Standards.

The Movement for Uniform Safety Standards and the Engineering Section's Part—David S. Beyer, Vice President and Chief engineer, Liberty Mutual Insurance Co. Boston, Mass.

Round-Table Discussion of:

Proposed Standards for Guarding of Belts, Gears, and other Power Transmission.

Statement of problem and opening of discussion by Thomas Stanion, Manager of Safety and Sanitation Department, Aluminum Manufacturers, Inc., Cleveland, Ohio.

EVENING DINNER

Subject: The Engineer's Place in the Modern Industrial World.

David Van Schaack.

Lew R. Palmer.

H. W. Forster.

It is expected that there will be a very heavy demand for places at the evening dinner which will be served in the Hotel Commodore. It is essential that the officers of the section be informed of the number of plates to be reserved. All who plan to be present at this dinner are therefore requested to send their reservations to the headquarters of the National Safety Council at Chicago, before April 23.

R. E. Plimpton, Formerly of S. A. E., Joins Wales Agency

Raymond E. Plimpton, formerly publication manager and field secretary of the Society of Automotive Engineers, has joined the Wales Advertising Co. of New York.

He will devote his time primarily to the handling of advertising campaigns of a technical and semi-technical nature.

He was for two years an engineering student with the General Electric Co. of Schenectady, N. Y., following which he was for three years assistant engineer of the General Vehicle Co., Long Island City.

After a year as assistant editor of *Power*, he was appointed publication manager and field secretary of the Society of Automotive Engineers which position he held for three years.

During the war Mr. Plimpton was an automotive engineer in the Motor Transport Corps, at Washington, and after the armistice was signed he was in entire charge of the Engineering Division.

He remained with the Motor Transport Corps for some months as one of the authors of the "History of Motor Transport Engineering in the World War."

Mohawk Valley Engineers' Club Has Talks on Welding

At the regular meeting of the Mohawk Valley Engineers' Club held recently, Jean P. Lelnroth, of the Bossert Corporation, spoke on electric and acetylene welding. Byron E. White, president of the club and of the Utica Gas and Electric Co., gave an interesting talk on heavy plate welding.

Obituary

Michael R. Conway, of Conway & Co., Cincinnati, Ohio, died April 1, at his home, 614 Hawthorne Ave., Price Hill, Cincinnati, Ohio.

James H. Kelly, president of the Rochester Lantern Co., and president of the Rochester Headlight Works, died recently at his home, 90 Oxford St., Rochester, N. Y.

William Milnor Roberts, Sr., at one time engaged in the machine and foundry business at Cumberland, Md., under the firm name of Gephart & Roberts, died on April 5 at his home in Cumberland. He was 81 years of age. In recent years he was engaged in farming.

Nathaniel W. Bishop, an official in several Bridgeport manufacturing plants, died at the Bridgeport Hospital, Sunday, April 4th. He was in his fifty-fifth year. Mr. Bishop was at one time secretary and general manager of the American Ordnance Co., Bridgeport, which is now the American and British Manufacturing Co. At the time of his death, Mr. Bishop was a member of the Library Board, Board of Finance of the City of Bridgeport, and also a director of the Connecticut National Bank, of Bridgeport.

Elmer Apperson

Elmer Apperson, president of the Apperson Bros. Automobile Co. of Kokomo, Ind., died on Mar. 29, while watching an automobile race. Mr. Apperson, with his brother, Edgard, built America's first mechanically successful automobile in 1894. He was in his fifty-eighth year; he died as he had lived—interested in that to which he had given his life's work. He was one of the best-known figures in the industry and his loss will be sincerely mourned by many.

Elmer Apperson was born at the family's homestead, three miles southeast of Kokomo, on Aug. 13, 1861. He was the second of three sons born to Elbert S. and Anna E. Apperson, and was also a great-great grandson of Daniel Boone, Kentucky's most famous pioneer.

Young Apperson began his education in the Dyar district school in Taylor township. He also attended the grade schools of Kokomo, and the normal school at Valparaiso. From his early youth he had an aptitude for mechanics. His apprenticeship as a machinist was served in the old Star Machine works in Kokomo, and his first employment as a finished craftsman was in the railroad shops at Peru. In 1888 he established a small machine shop in East Sycamore St., Kokomo, and in 1889 with his brother, Edgar, founded the Riverside Machine Works, on the site now occupied by the south side plant of Apperson Bros. Automobile Co.

The Riverside Machine Works was the first automobile factory in America although it never assumed that name. In this place Elmer and Edgar Apperson built America's first automobile. This car is now on exhibition in the mechanical department in the Smithsonian Institute at Washington, D. C. Mr. Apperson, in association with Elwood Haynes organized the Haynes-Apperson Automobile Co., the first automobile company organized in America for the production of motor cars. In 1901 the Appersons withdrew from the Haynes-Apperson Co. and organized the Apperson Bros. Automobile Co., of which Elmer Apperson has been the president since the organization. Success has crowned the work of the Apperson Brothers, all of which was merited, through the energy, skill and business foresight of its first and only president.

In the death of Elmer Apperson the automobile industry loses a man who has been potent in its development since the beginning. He was a prominent figure not only at the races but at all meetings where better work was talked over and improvements suggested. By many he has been referred to as "The Father of the American Automobile."

Mr. Apperson did not confine his investments to the automobile industry alone, but always manifested a deep interest in the city's commercial growth. He was a director in the Kokomo Trust Co. and a stockholder in the Curtiss-Indiana Co.

He was a member of the order of Elks; a member of the South Shore Country Club of Chicago; the Chicago Athletic Association of Chicago; the Burgesses Corps of Albany, New York, and the Kokomo Country Club.

For some years Mr. and Mrs. Apperson had maintained a home in Chicago and another in Kokomo. Most of their time, however, was spent in Chicago, where Mr. Apperson had a wide circle of business and club friends.

Mr. Apperson was united in marriage in 1912 with Catherine Elizabeth Clancy, the daughter of Matthew Clancy of Chicago. He is survived by the widow and two brothers, Oscar W., who resides on the Apperson homestead in Taylor township, and Edgar Apperson, of Kokomo.

Exports declared at the consulate at Lisbon, Portugal, for the United States advanced from $3,477,172 in 1918 to $6,725,685 in 1919, owing to increases in almost every line.

Business Items

The Davenport Machine and Foundry Co., Davenport, Iowa, has a new structural steel shop under construction.

The Murchey Machine and Tool Co., Detroit, Mich., has a Cleveland office at 511 Schofield Bldg., and a New York office at 99 Warren St. The Cleveland office is in charge of L. W. Arnold and the New York office is in charge of Charles M. Neth.

The Latrobe Electric Steel Co., Latrobe, Pa., announces that its recent fire has been greatly exaggerated in Pittsburgh papers. The fire was confined to the heat-treating department, the damage being $8,000. It will not interfere with the regular schedule of filling orders, and no employees will be laid off.

A six-day-a-week schedule will soon be resumed at the Pearl St. plant of the New York Air Brake Co. A new universal air valve for air-brake equipment has recently been invented and patented by C. E. Gray, superintendent. Quantity production of this new valve is one of the main reasons for resumption of full-time schedule.

The firm of Ellenwood & Doyle, 29 Great Jones St., New York City, which has just completed its first year as a distributor of tin plate, black and galvanized sheets, copper, brass, zinc, etc., in order to provide additional capital for its rapidly expanding business, has decided to incorporate under the laws of New York State for $150,000.

Joseph T. Ryerson & Son, Chicago, Ill., is issuing copies of its new bulletin, No. 1301, descriptive of its new line of Ryerson-Conradson high-power precision, selective-head engine lathes. These lathes are being built in five sizes of swing and with length of bed to suit the purchaser. All the details of construction are thoroughly described in this bulletin.

A new corporation, chartered under the laws of Indiana and known as the Hastings Manufacturing Corporation, Goshen, Ind., has taken over by purchase all the assets, good will, etc., and assumed all liabilities of the National Dairy Machine Co., an Indiana Corporation. The new corporation has been organized with the same officers and management as the old concern.

Mechanical consulting engineering offices have been opened at 226 Superior Ave., West Cleveland, Ohio, by Clifford H. Peters. Mr. Peters was recently a captain of the engineering division, Ordnance Department. His engineering practice includes the design, and construction of various types of automatic and semi-automatic machines, as well as plant layouts, production systems and similar engineering service.

Domestic Exports of Metal-Working Machinery from the United States by Countries During February, 1920

Countries	491 Lathes	492 Other Machine Tools	493 Sharpening and Grinding Machines	495 All Other
Azores and Madeira Islands	.....	.....	$292	$1,367
Belgium	$9,064	$21,256	6,034	112,797
Denmark	1,639	7,969	10,602	19,493
Finland	1,587	1,023	.....	.....
France	151,135	160,726	32,198	761,896
Germany	.....	.....	2,570	.....
Greece	.....	.....	34	10
Hungary	.....	.....	.....	2,324
Italy	4,059	67,864	1,926	73,824
Netherlands	6,975	4,681	3,694	24,900
Norway	3,240	4,139	804	300
Portugal	2,080	.....	687	3,154
Roumania	.....	99	.....	.....
Russia in Europe	.....	.....	.....	1,484
Spain	95,966	45,850	13,035	74,280
Sweden	4,460	922	1,691	9,773
Switzerland	2,187	3,013	.....	357,703
Turkey in Europe	.....	292	.....	.....
England	100,200	200,853	99,910	.....
Scotland	.....	26,305	.....	16,338
Ireland	.....	.....	.....	39,239
Canada	63,722	155,767	41,622	174,325
Costa Rica	.....	424	.....	.....
Guatemala	30	170	.....	.....
Honduras	.....	76	.....	634
Nicaragua	.....	264	14	651
Panama	98	514	.....	.....
Salvador	470	126	342	89
Mexico	3,804	7,632	586	6,077
Jamaica	.....	100	28	.....
Trinidad and Tobago	.....	507	70	182
Other British West Indies	.....	22	.....	.....
Cuba	28,232	61,800	2,570	23,234
Danish West Indies	.....	850	.....	583
Dutch West Indies	.....	28	.....	.....
French West Indies	1,175	.....	.....	385
Haiti	.....	560	.....	.....
Dominican Republic	.....	111	203	115
Argentina	4,425	16,562	.....	14,697
Bolivia	2,000	.....	248	.....
Brazil	3,695	11,050	1,947	30,239
Chile	6,863	10,068	5,443	8,319
Colombia	6,761	2,200	303	505
British Guiana	.....	270	.....	.....
Paraguay	.....	.....	.....	46
Peru	2,882	2,530	1,533	3,205
Uruguay	.....	2,830	180	5,050
Venezuela	.....	368	5,740	240
China	17,080	4,469	1,228	21,679
Kwantung	.....	90	.....	.....
British India	5,093	19,069	2,204	62,063
Straits Settlements	.....	203	.....	200
Other British East Indies	.....	.....	64	10
Dutch East Indies	2,870	7,958	124	16,851
French East Indies	.....	108	.....	80
Hongkong	.....	201	15	.....
Japan	18,942	15,109	14,876	107,858
Russia in Asia	3,966	.....	590	2,730
Australia	13,548	16,047	5,733	24,144
New Zealand	4,997	4,435	434	1,888
Other British Oceania	.....	.....	.....	12
Philippine Islands	3,837	398	.....	1,769
British South Africa	5,916	7,496	1,594	14,441
Canary Islands	.....	17	.....	.....
French Africa	.....	.....	.....	3,438
Morocco	1,200	95	.....	.....
Portuguese Africa	.....	139	.....	308
Egypt	3,150	.....	41	.....
Total	$587,348	$895,675	$261,209	$2,024,929

Personals

C. L. Sonen has recently resigned as production engineer of the Tector-Hartley Motor Corporation, Hagerstown, Md., and the Ansted Engineering Co., Connersville, Ind., and has organized the C. L. Sonen Co., industrial manufacturing engineer.

William Ochse, formerly tool supervisor of the Gould & Eberhardt Co. plants of Newark, N. J., has become associated with Manning, Maxwell & Moore Co., as representative in its Chicago office.

Colonel James B. Dillard, formerly chief of the engineering division of the Ordnance Department, has resigned his commission in the Army and is now a member of the executive staff of the Cleveland Twist Drill Co., Cleveland, Ohio.

Fred J. Passino, who has for many years covered the Southwest for the Independent Pneumatic Tool Co., of Chicago, has just been appointed assistant manager of the Eastern division, with headquarters at 1463 Broadway, New York.

G. E. McCabe has recently become associated with the Miller Saw-Trimmer Co., of Pittsburgh, as advertising manager. He was formerly with the Challenge Machinery Co. and the Keller Pneumatic Tool Co.

F. Ward Marcellus, formerly of Utica, N. Y., and who for the past two years has been treasurer of the Davis Machine Tool Co., has left that concern and has accepted an executive position with the High-Speed Hammer Co., Inc., Rochester, N. Y.

Leroy A. Rushford, former manager of the Interior Metal Manufacturing Co., Jamestown, N. Y., has been appointed general manager of the Prendergast Building Corporation.

John T. Lanman, assistant production manager of the Walworth Manufacturing Co., Boston, has been appointed assistant superintendent of materials at the Kewanee plant of that company. He has been succeeded at Boston, by John McCrahen, who has been with the Walworth company since 1916, save for a period with "Uncle Sam" across the water.

Clarence Bradley, formerly employment manager at the Automatic Machine Co., Bridgeport, Conn., is now an assistant employment manager at the Columbia Graphophone Manufacturing Co's West plant, in Bridgeport, Conn.

Vance McCarty, general sales manager of Edw. R. Ladew Co., Inc., maunfacturer of Ladew leather belting, has been made vice president of the Company. Mr. McCarty's connections with the company covers the past 20 years and embraces every phase of the leather belting business including manufacture, sale, branch management and general sales direction.

Russell B. Reid has been made assistant to the vice president of Edw. R. Ladew Co., Inc., manufacturer of Ladew leather belting. He has been with the company for 20 years.

Trade Catalogs

Machinery and Tools. Brown and Sharpe Manufacturing Co., Providence, R. I. Catalog, pp. 609, 3⅝ x 5¾ in. This catalog is an annual edition of what has been called the "Tool makers bible." It contains a description of the various machines, tools and appliances produced at the Brown and Sharpe shops and in addition considerable information as to the care and grinding of cutters. About 32 pages are devoted to gear cutter and gear cutting, some very useful formulas being given. This handy little catalog is much in demand by tool makers, nearly all of whom would not consider their kits complete without a copy.

Eye Protection. Strauss and Buegeleisen, 438 Broadway, New York City. Catalog, pp. 48, 7 x 4¼ in. These pages contain a collection of notes for the prevention of eye accidents.

Hump Method for Heat Treatment of Steel. Leeds and Northrup Co., Philadelphia, Pa. Catalog No. 90, pp. 30, 7¾ x 10½ in. In this catalog the company describes a new way of hardening steel. Accurate measurement of temperatures and the independent determination of transformation points is rendered unnecessary. A number of concerns are using this method for hardening tools and dies and for the quantity production of automobile gears, races for ball bearings, etc.

Milling Machines. Ingersoll Milling Machine Co., Rockford, Ill. Bulletin No. 39, pp. 23, 8½ x 11 in. This catalog contains descriptive matter of its continuous type milling machines, and it also describes fixtures and cutters.

Chucks. Frank G. Payson Co., 9 Soutn Clinton St., Chicago, Ill. Circular, 8½ x 11 in. It shows a number of illustrations of the Logan air-operated chuck, giving a brief description.

Gages. Greenfield Tap and Die Corporation, Greenfield, Mass. Catalog No. 43, pp. 110, 4¾ x 7¼ in. This company has issued a catalog containing information on screw cutting and gaging data. Complete gaging systems are shown and graphic tolerance charts. The latest methods in "precision" measuring and inspection are given and some gaging hints.

Radius Former. W. T. Smith Manufacturing Co., Bridgeport, Conn. Circular, 8½ x 11 in. An illustrated and descriptive circular of the Smith universal radius former.

Oilless Bearings. Massachusetts Oilless Bearings Co., Worcester, Mass. Catalog, pp. 15, 6 x 9 in. The first four pages of this catalog tell about the invention of the oilless bearing and the remaining pages are devoted to the description; several half tone illustrations are given.

Oil Burning System. Moore Shipbuilding Co., San Francisco, Cal. Catalog, pp. 40, 8 x 11½ in. The Moore Shipbuilding Co. has issued a new catalog on heavy coated stock, illustrating and describing its oil burning system. The interior of its machine shop, a general view of a ship under construction and a general plan of the Moore Shipyard at Oakland, Cal., are illustrated. There is a partial list of steamships built by this company in which this system has been installed and there are also several illustrations of these ships.

Drills. Silver Manufacturing Co., Salem, Ohio. Booklet, pp. 8, 5 x 7½ in. An interesting booklet describing the use of the drill in the World War; also gives two illustrations showing the layout of the first machine shop in the American sector and a rough sketch of the exterior.

Stubs Steels. The Selson Engineering Co., Inc., 24-26 Stone St., New York City, has announced that it is now distributing its catalog on stub steels.

Small Tools. Gale-Sewyer Co., South Weymouth, Mass. Catalog No. 3. 5½ x 7 in. This catalog describes and illustrates the various tools manufactured by this company.

Shepard Technical Night School. Electric Crane & Hoist Co., Montour Falls, N. Y., has issued a booklet announcing the different courses during the year 1920. It also gives several illustrations of its courses in machine-shop practice, blueprint reading, typewriting, office training and many others.

Flange Thread Miller. Smalley General Co., Inc., Bay City, Mich. Circular, 11 x 8½ in., contains suggestions on the operation of the Smalley general No. 1 flange thread miller.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

An importing firm in India desires to be placed in direct communication with manufacturers of hardware, engineer's tools, iron and steel products, such as mild steel plates, bars, angles, rivets, bolts, nuts, annealed wire, and barbed wire; industrial, agricultural, and textile machinery; ginning, weaving, and spinning parts of machinery; electrical goods, provisions, perfumery, motors, and dynamos, stationery, and sundries, and colors and chemicals. References. No. 32,447.

The manager of a farmers' cooperative association in South Africa desires to receive full particulars and prices from manufacturers for the purchase of small-size oil-mill machinery, particularly machinery for extracting cotton-seed oil. Firms are also requested to submit catalogues, outline sketch plans of a small mill layout, and prices. Quotations should include power equipment, alternative gasoline or kerosene engine, electric engine, or possibly a small steam engine. No. 32,446.

General importers and exporters in Syria desire to be placed in touch with manufacturers and exporters of agricultural implements, automobiles, machinery, pumps, engines and tools, tin, iron and steel. No. 32,458.

A firm of engineers and merchants in India desires to import and secure agencies for all classes of hardware, such as wood screws, wire nails, galvanized wire bolts and nuts, rivets, files, tool steel, and anvils; mill, cotton-gin, and railway supplies; machinery, electrical goods, metals and metal ware, brass and copper tubes, motor cars, motor cycles and parts. Reference. No. 32,493.

A commercial agent in Switzerland desires to secure the representation of firms for the sale of machinery, machine tools, and agricultural machinery. Correspondence should be in French. Reference, No. 32,497.

The representatives in the Mediterranean countries of a firm in the United States desire to obtain agencies for the sale of machinery and agricultural implements. Reference. No. 32,472.

A firm of engineers and contractors in Siberia desires to get in touch with manufacturers and exporters, in order to secure agencies in Russia and Siberia for steel, mining equipment, pumps, piping, saws, files, nuts, bolts, rivets, wire and wire rope, pneumatic drilling equipment, tin plate, electrical machinery, steam engines, metal working and woodworking machinery, tools, metals, rubber goods for industrial purposes. Correspondence may be in English. References. No. 32,473.

A former president of the Victorian Institute of Electrical Engineers in Australia, is anxious to make early connections with an American manufacturer who is able to participate in bidding on tenders soon to be called for by the Victorian Government, covering equipment for a high-tension project involving three turbo-generators of 25,000 kw. capacity, for 130,000-volt, 50-cycle transmission, and the appliances and accessories required with such an installation. Reference, No. 32,083.

A city in Canada is in the market for $200,000 worth of rolling stock to be placed on the civic car lines. Tenders should be submitted, and it will be for the city council to decide whether American cars are purchased. No. 32,093.

One of the largest printing plants in Czecho Slovakia wishes to purchase presses for the printing of bank notes, bonds, etc., and also equipment for the making of necessary plates, printing and embossing presses, and complete engraving equipments, also outfit equipment and presses for steel engraving. Catalog and prices are requested. No. 32,094.

A commercial agent in France desires to represent firms in France and colonies, and in the principal cities of Europe, for the sale of machine tools. Quotations should be given c.i.f. France, Dantzig, Antwerp, Genoa, Constantinople, Oriental ports and Black Sea ports. Correspondence may be in English. References. No. 30,095.

An agency is desired by a man in New Zealand for the sale of wire nails, nail wire, galvanized plain and barbed wire, plain and galvanized corrugated iron, malleable pipe fittings, galvanized and black pipe, and galvanized slice cut staples. Quotations should be given c.i.f main ports of New Zealand. Payment by sight draft against documents. References. No. 32,096.

Forthcoming Meetings

The National Chamber of Commerce will meet in Atlantic City, N. J., on April 26, 27 and 28.

The spring conference of the engineering section of the National Safety Council will be held at the Engineering Societies Building, New York City, April 27. Sidney J. Williams is the secretary; headquarters, 168 North Michigan Ave., Chicago, Ill.

The American Gear Manufacturers' Association will hold a meeting at the Hotel Statler, Detroit, Mich., on April 29, 30 and May 1.

The American Supply and Machinery Manufacturers' Association, the Southern Supply and Machinery Dealers' Association and the National Supply and Machinery Dealers' Association, will meet jointly on May 17, 18 and 19 at Atlantic City, N. J., at the Hotel Marlborough-Blenheim. F. D. Mitchell is the secretary and treasurer of the American Supply and Machinery Manufacturers' Association, with an office at 4106 Woolworth Building, New York City.

The National Association of Manufacturers will hold its annual convention in the Waldorf-Astoria, New York, on May 17, 18 and 19. A "Silver Jubilee" session will be held on the evening of May 17.

The National Machine Tool Builders' Association will hold its spring meeting on May 20 and 21, at the Hotel Traymore, Atlantic City, N. J.

The American Society of Mechanical Engineers will hold its spring meeting at St. Louis, Mo., May 24, 25, 26, 27, 1920, and will have its headquarters at the Hotel Statler.

The American Iron and Steel Institute will hold its spring meeting at the Hotel Commodore, New York City, May 28.

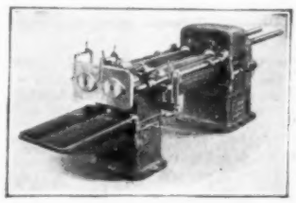
The American Drop Forge Association will hold a meeting at the Hotel Marlboro-Blenheim, Atlantic City, N. J., on June 17, 18 and 19. E. J. Frost, of the Frost Gear and Forge Co., Jackson, Mich., is president.

The American Society for Testing Materials will hold its next annual meeting during the week of June 21, 1920, at the New Monterey Hotel, Asbury Park, N. J. This society has its headquarters in the Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa. C. L. Warwick is the secretary and treasurer.

Condensed-Clipping Index of Equipment

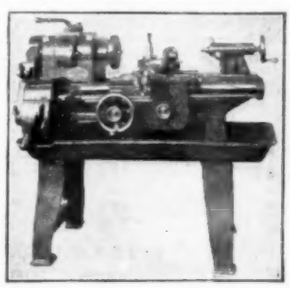
Patented Aug. 20, 1918

Broaching Machine, No. 3 Duplex.
Lapoint Machine Tool Co., Hudson, Mass.
"American Machinist," April 1, 1920



Specifications: Size, No. 3 double-screw. Capacity, will cut keyways up to 1¼ in. wide, or broach square holes up to 3 in. across flats from drilled holes in steel. Maximum stroke, 50 in. Holes in faceplate of machine 5 in. (Center distance between holes 13 in.) Driving screws 2¾ in. in dia., 1½ Acme threads per in. Length of driving nut 10 in. Driving pulley 19 x 6¼ in. Pulley speed 450 r.p.m. Speeds: fast cutting, 74 in.; slow cutting, 49 in.; return, 196 in. per min., vertical adjustment of draw head 1⅛ in. below and 1¼ in. above center of faceplate. Floor space, allowing for travel of screw and broach, 180 x 28 in. Motor recommended, 15 hp.

Lathe, Manufacturing.
O. R. Adams Mfg. Co., Inc., Rochester, New York.
"American Machinist," April 1, 1920



Headstock has six changes of speed, from 43 to 375 r.p.m.; can be changed while lathe is in operation. When starting lever is in neutral, spindle is held by a brake. Spindle runs in taper-bronze bearings. All gears run in oil.

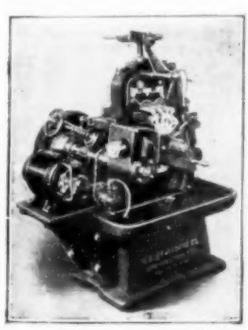
The feed-gear box is tumbler type, provides four changes of feed from 0.006 to 0.025 in. per revolution, by changing gears at one end of lathe a second ratio of feeds from 0.010 to 0.42 is provided for.

Specifications: Swing, over bed, 13⅜ in.; over carriage, 7¾ in. Distance between centers 20 in. Length of bed 48 in. Weight 1,350 lb.

Quenching Machine, Browning.
Machine Products Co., East 179th St., St. Clair Ave., Cleveland, Ohio.
"American Machinist," April 1, 1920

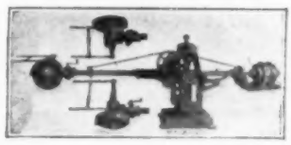
Two die castings provided to which special dies made to fit the gear blanks are to be fastened. Gear blank is clamped between dies by compressed air controlled by four-stage valve. With the valve in first position both dies are raised. In second position, upper die is further raised and gear blank can be placed on lower die. In third position, the upper die descends, clamping gear blank between both dies. In fourth position, dies and gear blank are submerged. The door in front is for access to the stuffing box, etc., below the diaphragm. The machine is 42 in. in diameter and 38 in. high.

Sawing Machine, Cold.
Higley Machine Co., South Norwalk, Conn.
"American Machinist," April 1, 1920



This model, "11½ B" has a capacity up to 3 in. on either square or round stock; four 1½-in. rods may be cut off at the same time and, by shifting the V-plate on the table, two 3-in. rods may be cut off. ¾-hp. motor connected to drive shaft through spur gearing. Shaft runs in bronze-bushed bearings and carries a worm of hardened steel, meshing with a bronze gear. On same shaft is carried sprocket that is geared to saw. Automatic arrangement regulates depth of cut and returns the saw to lowest position when cut is completed. Machine is made for belt drive as well as for motor drive.

Grinding Machine, Portable Radial.
Mummert-Dixon Co., Hanover, Pa.
"American Machinist," April 1, 1920

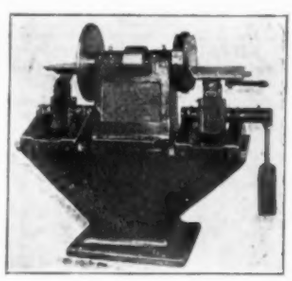


Specifications: Grinding wheel; face, 3 in.; diameter, 20 in.; hole, 2 in. Speed of wheel arbor, 1,000 r.p.m. Motor, hp., 7½; speed, 1,200 r.p.m. Length of arm, trolley to head, 7 ft. Working area; annular 36 in.; radial 6 to 8 ft. Dimensions: height over all, 5 ft.; length overall, 13 ft. Weight with motor net, 2,600 lb.; crated, 2,800 lb.; boxed for export, 3,000 lb.

Potentiometer, Portable.
Brown Instrument Co., Philadelphia, Pa.
"American Machinist," April 1, 1920

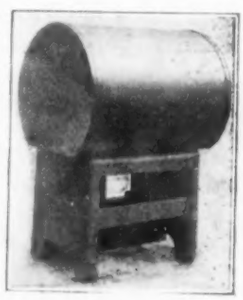
Permits the exact measurement of all e.m.f.'s required in pyrometry; specially serviceable for checking millivoltmeters and potentiometers and directly determining the e.m.f.'s of thermo-couples. Limit of accuracy in an instrument of this type determined by scale length, usually about 10 in. Scale of the Brown potentiometer is nearly 96 in. in length. With a range to 50 millivolts each millivolt is nearly 2 in. in length, graduated to one-fiftieth of a millivolt. Current required to operate never more than 0.00036 ampere.

Grinding Machine, No. 4.
Badger Tool Co., Beloit, Wis.
"American Machinist," April 1, 1920

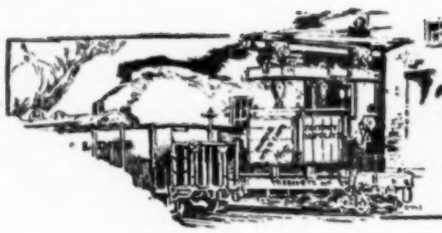


Spindle is mounted in both radial and thrust ball-bearings and carries on one end a disk for abrasive paper and on other end a chuck for a cylinder wheel. Table at the left side is a plain swinging table, while the one at right is provided with a lever feed. Machine can be furnished with dust hoods for dry grinding and with guards, pump and connections for wet grinding. Capacity: Disk, 18 in.; chuck, 14 in. Diameter of spindle, 2 in. Pulley, 7½ x 4½ in. Weight complete with countershaft and press for gluing disks, 2,300 lb.

Heater, Berwick Electric Rivet.
American Car and Foundry Co., 165 Broadway, New York.
"American Machinist," April 1, 1920



Design employs step-down transformer principle. There is no smoke or heat. On account low voltage, there is no danger to operate. Plain uninsulated tongs used, and it is not necessary for the operator to wear gloves or goggles. Each electrode consists of an open, flexible, secondary link, with two solid copper terminals called jaws. Lower jaw is connected to a treadle which, when pressed down, makes an opening according to capacity of machine, into which is inserted vertically rivet to be heated. The lower jaw ascends and holds rivet firmly in place when operator removes foot from treadle. It is through these jaws the low-voltage high-amperage current passes to rivet.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Year Ago
No. 2 Southern	$44.60	$30.35
Northern Basic	42.80	27.55
Southern Ohio No. 2	43.80	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	48.65	32.40
Southern No. 2 (Silicon 2.25 to 2.75)	47.70	34.70
BIRMINGHAM		
No. 2 Foundry	41.00	26.75
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25–2.75 sil.	45.35–45.65*	31.90–45.35*
Virginia No. 2	44.25*	33.25*
Basic	43.00†	29.65†
Grey Forge	42.50*	29.65*
CHICAGO		
No. 2 Foundry local	43.25	26.75
No. 2 Foundry, Southern	46.60	33.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	43.65	26.25
Basic	42.90	25.75
Bessemer	43.40	29.35
MONTREAL		
Silicon 2.25 to 2.75%	43.25	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.47	$3.97	$3.47	$5.50	$3.37	$3.97	$3.47
Soft steel bars	4.62	4.12	3.37	5.00	3.27	3.87	3.37
Soft steel bar shapes	4.62	4.12	3.37		3.27	3.87	3.37
Soft steel bands	5.82	5.32	4.07	6.25			
Plates, ¼ to 1 in. thick	4.67	4.17	3.67	5.00	3.57	4.17	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.35
Warehouse, New York	4.57	3.37
Warehouse, Cleveland	3.42	3.22
Warehouse, Chicago	3.52	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Large Mill Lots	New York			
Blue Annealed	Pittsburgh	Current	One Year Ago	Cleveland	Chicago
No. 10	3.55–4.00	6.62@8.00	4.57	7.30	6.02
No. 12	3.60–4.05	6.67@8.05	4.62	7.40	6.07
No. 14	3.65–4.10	6.72@8.10	4.67	7.45	6.12
No. 16	3.75–4.20	6.82@8.20	4.77	7.55	6.22
Black					
Nos. 18 and 20	4.15–4.80	7.80@8.80	5.42	7.95	6.80
Nos. 22 and 24	4.20–4.85	7.85@8.85	5.47	8.00	6.85
No. 26	4.25–4.90	7.90@8.90	5.52	8.05	6.90
No. 28	4.35–5.00	8.00@9.00	5.62	8.15	7.00
Galvanized					
No. 10	4.70–6.00	8.25@10.00	5.97	8.50	7.15
No. 12	4.80–6.10	8.35@10.10	6.02	8.60	7.20
No. 14	4.80–6.10	8.35@10.10	6.07	8.60	7.35
Nos. 18 and 20	5.10–6.40	8.65@10.40	6.37	8.90	7.65
Nos. 22 and 24	5.25–6.55	8.80@10.55	6.52	9.05	8.05
No. 26	5.40–6.70	8.95@10.70	6.67	9.20	8.20
No. 28	5.70–7.00	9.25@11.00	6.97	9.50	8.50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled. **Automobile sheets are unavailable except in fugitive instances, when prices range to 10c per lb.**

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.00	$5.40	$5.50
Flats, square and hexagons, per 100 lb. base	6.50	5.90	5.50–6.00

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	55
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$25.50–30.00
Cleveland	20.00	20.00
Chicago	21.00	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 12c. per lb.

WELDING MATERIAL (SWEDISH)—These prices are the best we have been able to obtain for Swedish welding materials, of which it is reported that very little are on the market.

Welding Wire		Cast-Iron Welding Rods	
1/16, 3/32, 1/8, 5/32, 3/16, No. 8, 5/16 and No. 10, 1/4, No. 12, 5/16, No. 14 and 1/16, No. 18, No. 20	21.00 to 30.00	1/8 by 12 in. long	14.00
		1/4 by 19 in. long	12.00
		3/8 by 19 in. long	10.00
		1/2 by 24 in. long	10.00
		Special Welding Wire, Coated	
		1/4	33.00
		5/16	30.00

Domestic—Welding wire in 100-lb. lots sells as follows, f. o. b. New York: 5/16, 8½c. per lb.; ¼, 8c.; 5/32 to 1/16, 7½c.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	9.00
Spring steel (light)	8.00	11.00	12.25
Coppered bessemer rods	8.00	8.00	7.35
Hoop steel	6.07	6.50	5.32
Cold-rolled strip steel	12.50	8.25	10.00
Floor plates	6.55	6.00	6.52

PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

	Steel			Iron	
Inches	Black	Galvanized	Inches	Black	Galvanized
BUTT WELD					
1/8, 1/4 and 3/8	47%	20½%	1/8 to 1¼	34½%	18½%
1/2	51%	36½%			
3/4 to 3	54%	41½%			
LAP WELD					
2	47%	34½%	2	28½%	14½%
2½ to 6	50%	37½%	2½ to 6	30½%	17½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1/8, 1/4 and 3/8	43%	25½%	1/8 to 1/4	34½%	19½%
1/2	48%	35½%			
3/4 to 1¼	52%	39½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	45%	33½%	2	29½%	16½%
2½ to 4	48%	36½%	2½ to 4	31½%	19½%
4½ to 6	47%	35½%	4½ to 6	30½%	18½%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1/8 to 3 in. steel butt welded	40%	24%	40%	31%	54%	40½%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	50%	37½%

Malleable fittings, Class B and C, banded, from New York stock sell at plus 23% Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	19.25	18.50	15.37½
Tin in 5-ton lots	62.25	61.50	72.50
Lead	9.00	9.00	5.25
Spelter	9.00	8.70	6.65
ST. LOUIS			
Lead	8.75	8.87½	5.00
Spelter	8.50	8.37½	6.30

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York			Cleveland		Chicago* April 8	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	29.50	29.50	22.50	31@32	24.50	36.00	26.00
Copper wire (carload lots)	29.25	29.25	23.00	29.50	23.00	27.00	22.00
Brass sheets	26.50	26.50	18.75	29.00	25.00	27.00	21.50
Brass pipe	32.00	32.00	28.00	34.00	33.00	35.00	31.00
Solder (half and half) (case lots)	39.00	39.00	46.50	40.50	41.50	38.00	39.00

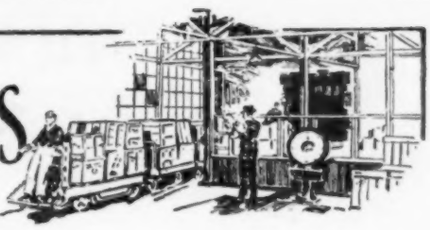
* Chicago—No stocks of brass and copper. Orders for future delivery are accepted subject to confirmation and price fixing at 60 days before shipment—which is at manufacturer's convenience.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	18.00
New York	23.75	19.50
Cleveland	27.00	24.00
Chicago	26.00	24.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:
Carload lots f.o.b. mill..... 12.00

	—In Casks— Current	One Year Ago	— Broken Lots — Current	One Year Ago
Cleveland	15.00	14.45	15.50	14.80
New York	14.00	12.00	14.50	13.00
Chicago	15.00	16.50	15.00	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	11.25	6.75
Chicago	11.50	7.75
Cleveland	13.00	9.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York — Current	One Year Ago	—Cleveland— Current	One Year Ago	Chicago
Copper, heavy, and crucible	16.50@17.25	13.00	17.00	14.00	17.25
Copper, heavy, and wire	15.75@16.00	12.00	17.00	13.00	16.25
Copper, light, and bottoms	14.50@17.50	10.50	15.50	11.00	15.25
Lead, heavy	7.75@ 8.00	4.25	8.50	4.50	7.75
Lead, tea	5.75@ 6.00	3.50	5.50	3.50	6.75
Brass, heavy	9.50@10.00	8.00	13.50	9.00	17.00
Brass, light	9.00@ 9.25	6.00	10.50	6.50	10.50
No. 1 yellow brass turnings	8.75@ 9.25	7.00	10.75	7.00	10.75
Zinc	5.25@ 5.75	4.50	6.00	4.00	6.50

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb.	33.00	34.00c.@35.00c	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	25.00
Chicago	29.00	28.00
Cleveland	32.00	28.00

BABBITT METAL—Warehouse price per pound:

	—New York— Current	One Year Ago	—Cleveland— Current	One Year Ago	— Chicago — Current	One Year Ago
Best grade	90.00	87.00	74.50	79.00	70.00	75.00
Commercial	50.00	42.00	21.50	18.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York — Current	One Year Ago	— Cleveland — Current	One Year Ago	— Chicago — Current	One Year Ago
Hot pressed square	+$3.00	.25	$ .75	$1.90	$1.25	1.28
Hot pressed hexagon	+ 3.00	.25	.75	1.90	1.25	1.08
Cold punched hexagon	+ 3.00	.25	.75	1.90	.90	1.30
Cold punched square	+ 3.00	.25	.75	1.90	.90	1.30

Semi-finished nuts, $\frac{5}{16}$ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50-10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
$\frac{1}{2}$ by 4 in. and smaller	20%	40%	35-5%
Larger and longer up to 1$\frac{1}{2}$ in. by 30 in.	10%	20+10%	25-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:
For wrought-iron washers:
New York..... list Cleveland..... $3.75 Chicago..... $3.00
For cast-iron washers, $\frac{1}{2}$ and larger, the base price per 100 lb. is as follows:
New York..... $5.00 Cleveland..... $4.50 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
$\frac{1}{2}$ by 6 in. and smaller	20%	35%	30%
Larger and longer up to 1 in. by 30 in.	10%	20%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets Current	Rivets One Year Ago	Burs Current	Burs One Year Ago
Cleveland	20%	20%	30%	10%
Chicago	10%	10%	10%	10%
New York	30%	40%	30%	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel $\frac{1}{2}$ and smaller	30%	45%	45%
Tinned	30%	45%	45%

Boiler, $\frac{1}{2}$, $\frac{7}{8}$, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York...$6.00 Cleveland...$4.00 Chicago....$5.37 Pittsburgh...$4.72
Structural, same sizes:
New York...$6.10 Cleveland...$4.10 Chicago....$5.47 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	34.00	36.00	35.00
Brass	33.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as $\frac{1}{4}$-2 in. inclusive in rounds, and $\frac{1}{2}$-1$\frac{1}{2}$ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $8.50 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York — Current	One Year Ago	Cleveland	Chicago
White	13.00	13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	9.00–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13$\frac{1}{4}$x13$\frac{1}{4}$	13$\frac{1}{4}$x20$\frac{1}{4}$
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.25	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.25	3.62
Chicago	5.00	5.00	4.125

COKE—The following are prices per net ton at ovens, Connellsville:

	Apr. 15	Apr. 8	Apr. 1	Mar. 25
Prompt furnace	$11.00@$12.00	$11.00@$12.00	$11.00@$12.00	$6.00
Prompt foundry	12.00@ 13.00	12.00@ 13.00	12.00@ 13.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	— New York — Current	One Year Ago	Cleveland	—— Chicago —— Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.87	$1.55	$2.08	$2.05	$1.66
5-gal. cans (without cans)	1.87*	1.70	2.25	2.30	1.86

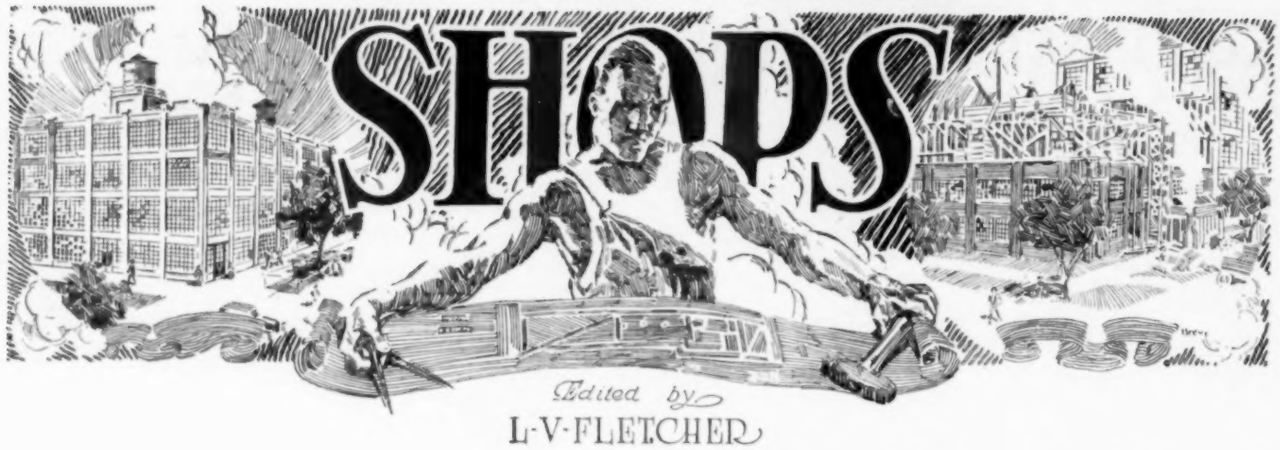
*To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEAD—Base price per pound:

	Red — Current Dry	Current In Oil	One Year Ago Dry	One Year Ago In Oil	White — Current Dry and In Oil	White — One Year Ago Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12$\frac{1}{2}$-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2$\frac{1}{2}$% discount.

NEW and ENLARGED



Edited by
L·V·FLETCHER

Machine Tools

The following concerns are in the market for machine tools.

R. I., Pawtucket—F. Conlon, Summit St.—garage repair equipment.

R. I., Providence—G. Scunzio, Douglas Ave. and Clym St.—garage equipment.

Md., Baltimore—The Coale Muffler and Safety Valve Co., 325-335 East Oliver St., J. A. Vaeth, Purch. Agt.—several 18 in. Warner & Swasey turret lathes (used).

Md., Baltimore—The Spann Motor Co., East and Philadelphia Aves.—machine shop tools and supplies.

N. J., Camden—The Victor Talking Machine Co., Front and Cooper Sts.—bench lathes.

N. J., South Plainsfield—The Spicer Mfg. Co.—one 6 in. x 14 ft. tool room lathe and one No. 2 universal miller.

N. Y., Amsterdam—The Shuttlesworth Bros.—One 36-in. lathe, 19-20 ft. centers.
One 24 in. x 14 ft. lathe.
One 16 in. x 12 ft. lathe.
One 14 in. x 12 ft. lathe.
One speed lathe, 9 in. x 2 ft.
One Jones & Lamson turret lathe.
Or 4 ft. radial drill.
Two 23 in. Snyder drills.
One mason drill, ⅜ in.
One universal miller, about No. 1.
One 48 in. x 14 ft. lathe.
One 24 in. x 12 ft. lathe.
One ¼ to 1¼ in. bolt header.
One keyseater, 1 x 1 in. capacity.
One universal grinder.
One electric center grinder.
One 10 in. shaper.
One portable electric forge.
One 16 in. shaper.

N. Y., Buffalo—The G. A. Ray Mfg. Co., 1495 Niagara St.—one 30 to 36 in. square shear, and one 15 in. drill press.

N. Y., Frankfort—The United Tractors Corp.—general machine shop tools, machinery and equipment.

N. Y., Jamaica—The McPhilbin Lighting Fixture Co., 264 Fulton St.—hand screw machines.

N. Y., New York (Borough of Brooklyn)—The General Insulate Co., 1008 Atlantic Ave.—one No. 1 miller (plain).

N. Y., New York (Borough of Manhattan)—The Cornell Iron Works, 26th St. and 11th Ave.—1 bench type drill grinder, capacity No. 60 to ⅝ in. drills.

N. Y., New York (Borough of Manhattan)—The C. Helmuth Co., Inc., 154 West 18th St. St.—one 20 in. x 10 ft. lathe and one 20 in. x 12 ft. lathe.

N. Y., New York (Borough of Manhattan)—The U. S. Roller Bearing Co., 30 Broad St.—lathes and auto screw machines.

N. Y., Ogdensburg—The Ogdensburg Machine Co.—general machine shop equipment.

N. Y., Poughkeepsie — The Willys-Overland Corp. (Auto-Lite Division)—drill presses, engine lathes and general machine equipment.

N. Y., Redwood — The Kable Bros.—light lathe, shaper, miller, drill press and tool grinder.

N. Y., Watertown—G. A. Grappotte, 42 Cross St.—light machine tools for automobile and truck repair.

N. Y., Watertown—The Northern Machine Corp.—general machine tools for hydraulic turbine manufacture and heavy paper mill machinery repair work.

N. Y., Watertown—The Weldon Sales Co., 306 Factory St.—lathe and drill press.

Pa., Philadelphia—I. W. Guild, 119 North 3rd St.—one No. 7 Bliss press, one No. 1½ Van Norman duplex miller, one 20-24 in. Gould & Eberhardt shaper, and one Cincinnati or plane miller any size.

Ill., Chicago—The Crane Co., 836 Michigan Ave., V. E. Flood, Purch. Agt.—general machine tools and foundry equipment.

Ill., Chicago—The Western Electric Co., 500 South Clinton St.—sensitive drill presses, multiple spindle drill presses and small power presses.

Ind., Columbus—The Cummins Engine Co., Inc.—one Hald cylinder grinder (used).

Mich., Detroit—Dept. of Parks and Boulevards, Farwell Bldg.—1 pipe threading machine with motor, and 1 pipe cut off machine with motor.

Mich., Detroit—Detroit Bd. of Water Commissioners, 232 Jefferson Ave.—1 milling machine for machine repair shop.

Mich., Detroit—The Detroit Twist Drill Co., Fort St.—general machine tool equipment for the manufacture of twist drills.

Mich., Detroit — E. Donovan, 143 Ivanhoe Ave.—automobile and tire repair equipment, including vulcanizing outfit, air compressor, and small tools.

Mich., Detroit—Michigan Motor Specialties Co., 26 Duboise St.—miscellaneous machine shop equipment.

Mich., Detroit—The O. & S. Bearings Co.—equipment for production of oiless bearings.

O., Columbus—The Eaton Machine Wks., 375 South Scioto St., L. J. Teasel, Purch. Agt.—1 shaper, 1 small lathe and one 60 in. lathe.

O., Columbus—The Jaeger Machine Co., 529 Dublin Ave., Y. Jaeger, Mgr.—one 24 in. tool room lathe.

Wis., Hortonville—The Dabareiner Hardware Co.—auto repair machine tools.

Wis., Milwaukee—The All-Tite Chain Co., 229 27th St., F. Hoya, Purch. Agt.—tool room equipment, die making machinery and stamping presses.

Wis., Milwaukee—The Milwaukee Gear Co., 2021 Walnut St., E. G. Borisch, Purch. Agt.—1 engine lathe.

Wis., Milwaukee—The A. H. Petersen Mfg. Co.—one ⅞ in. Gridley auto screw machine (used).

Wis., Oconto Falls—The Oconto Falls Motor Co., J. W. Munsert, Mgr.—equipment for auto repair work.

Tex., Dallas—The Genl. Motors Co.—garage equipment and machine tools.

Ariz., Bisbee—The Shattuck Arizona Copper Co.—one 20 or 24 in. back geared drill press.
One 20 or 24 in. quick change lathe.
One 8, 10 or 12 in. high speed sensitive drill press.

Ore., Baker—J. A. Gyllenberg, Auburn and 10th Sts.—one No. 60 Heald cylinder grinder and one crankshaft grinder.

Que., Montreal—Williams & Wilson, Ltd., 84 Inspector St.—one No. 2 Browne & Sharpe universal grinder (new).

Machinery

The following concerns are in the market for machinery.

Conn., Bridgeport — The Amer. Chain Co., Connecticut St.
100 to 200-ton knuckle jointed geared press, similar to Waterbury Farrell No. 205, for use in York, Pa., plant (new or used).
One 1,200 Billings & Spencer board drop-hammer.
One 1,600 Billings & Spencer board drop hammer.
One No. 74 ½ heavy type Bliss press.
One No. 74½ light geared Bliss press.
One No. 6 Bliss press.
One No. 5 Acme upsetter.
One Acme bull-dozer, 4in. stock.
One Acme power hack saw.

R. I. Newport—Bureau of Ordnance, Washington, D. C.—Schedule 5890, 1 drill press, 1 tapping machine and 1 miller.
Schedule 5891, Angle bending roll and power punch.
Schedule 5892, pipe threader and pipe cutter.

Md., Baltimore—The Harvey Co., 113 South St., H. C. Busick, Purch. Agt.—72 and 84 in. gate shear.

Md., Baltimore—The L. Rosenfeld Mfg. Co., 105 Hanover St.—one 48 in. squaring shear.

N. J., Garfield—F. H. Fial, Fall River Drive—brush and broom machinery.

N. J., Newark—The H. A. Inman Co., 40 East Ave.—foundry machinery and equipment for brass and iron casting.

N. Y., Dansville — The Young & Fenstermacher Coal Co., Spruce St.—machinery for handling and conveying coal.

N. Y., Geneva—The Geneva Limestone Co.—quarrying machinery and equipment.

N. Y., Governeur—H. H. Noble—coal conveying, elevating and handling machinery and equipment.

N. Y., Johnson City—The McGill & Holford Co.—foundry machinery and equipment.

N. Y., New York (Borough of Brooklyn)—The Standard Ship Repair Co., 160 Bway.—2 punches and shears with throat 25-in. or larger (new or used).

N. Y., New York (Borough of Manhattan)—The S. Ransom Co., Inc., 404 West St., W. J. Finley, Purch. Agt.—one 10 or 12 ft. boring mill.
One power shear, capacity 1 in. stock.
One 16 or 18 ft. power flanging machine.
One vertical deep throat punch and shear.
One horizontal punch to take beams.

N. Y., New York (Borough of Manhattan)—The Standard Oil Co., 26 Broadway—power presses.

Pa., Beryn—The Amer. Bronze Corp.—one No. 56 straight side Toledo or similar power press.

Pa., Erie—The Merwin Mfg. Co.—sheet metal stampers and No. 20 Bliss press.

Pa, Franklin— The C. N. Hough Co., Oil City Turnpike—2¼ Gridley 4 spindle automatic screw machine, with full equipment and countershaft.

Pa., Springboro—The L. C. Graves Co.—one 1 in. feed glue jointer, one 12 ft. glue clamp machine.

Ill., Chicago — The Bremer Mfg. Co., 846 Canal St.—1 No. 5 punch press, back geared or direct.

Ill., Chicago — The Wilcox Pressed Steel Co., 1735 Armitage Ave.—one Bliss No. 75½ squaring shear.

Ill., Chicago — The H. P. Young Co., 20 Jackson Blvd.—grinding machine for use in making iron filter frames.

Ill., Decatur — The Leader Iron Wks. Co. — 5 ft. radial drill with taper attachment, motor or belt driven.

Ill., Peoria—The Holt Mfg. Co., West Washington St.—2 milling machines, 48 in. wide, 24 in. high and 16 ft. table, with adjustable cross rail; 2 vertical type milling machines: No. 5, and 2 horizontal machines of same size.

Mich., Detroit—Detroit Metal Weather Strip Co., 120 East Woodbridge St.—presses and shears for light sheet metal work.

Mich., Detroit—The Detroit Pressed Steel Co., 1800 Mt. Elliott St.—one motor drive gantry crane, ten ton capacity, 120 ft. span, for 220-v., A. C., 60 cycle current.

Mich., Detroit—Lincoln Mfg. Co., 716 Erskine St., Mr. G. Shaber, Purch. Agt.—medium capacity hoists with or without motor, lift 15 in.

Mich., Detroit—A. MacLachlan, 1414 Rivard St.—1 large squaring shear for sheet metal, capacity up to about 60 in.

Mich., Grand Rapids—The Cheney Talking Machine Co.—presses for forming phonograph turn tables.

Mich., Grand Rapids—Sterl Woodturning Co., 510 Monrow Ave., N. W.—wood turning lathes.

Mich., Manistee—The Manistee Canning Co.—miscellaneous carriers and canning equipment.

Mich., Marshall—The Flint Foundry Co.—foundry equipment, including crane.

Mich., Menominee—The Hoskin Morainville Paper Co.—one 15 ton travelling crane.

Mich., Munising—Munising Woodenware Co.—wood working plant equipment.

Mich., Port Huron — South Park Welding Wks., 2319 Conners St.—acetylene welding equipment.

O., Canton—The Timken Detroit Axle Co., Waynesburg Rd. and Belden Ave.—power presses.

O., Cleveland—The Amer. Fork and Hoe Co., Swetland Bldg.—power presses and equipment for production of garden tools.

O., Cleveland — The Bd., Educ., Rockwell Ave., and East 6th St.—manual training equipment.

O., Cleveland—The J. R. Gloyd Co.—punch press, to make ⅞ in. holes through ½ in. material, cutting off shear for 4 x 4 in. angles, yoke riveter and air compressor, 6 x 6 or 8 x 8 in.

O., Columbus—The Central Foundry and Supply Co., 825 Reynolds Ave.—serpentine or circular shear, up to ¼ in., preferably up to ½ in.; press for flanging ladle bottoms, 4 in. stroke.

O., Trumbull—The Bd. Educ., C. Cliffe., R. F. D. 3, Youngstown—manual training equipment.

Wis., Milwaukee — The Milwaukee Rolling Mill Co.—annealing ovens and equipment.

Wis., Milwaukee—The Utility Pattern Wks., 754 South Pierce St.—pattern making machinery.

Wis., Oskosh—The Wisconsin Parts Co.—one No. 2100 Consolidated press.

Minn., Duluth—The F. Y. B. Co., c/o F. A. Lohmer, Box 86—forging machines, stamping machines, oil tempering apparatus and other machinery for making horse shoe calks.

Mo., St. Joseph — The Missouri Methodist Hospital Assn.—laundry equipment.

Mo., St. Joseph—The St. Joseph Structural Steel Co.—1 set of steel bending rolls, 1 spacing table, 1 bevel shear and 1 multiple punch (new).

Mo., St. Louis—The Laclede Iron Wks., 1547 North 9th St.—one No. 35 Swaine power press.

Neb., Norfolk—The Square Turn Tractor Co.—machine for bending sheet metal up to 14 ga., 8 ft. long, at right angles.

Wash., Seattle—The Seattle Baking Co., 302 19th South St.—complete machinery for bakery, including traveling ovens, elevators, elevating cages, etc.

Ont., Toronto—The Canada Bread Co., 1600 Avenue Rd—bake ovens and dough mixers, electrically operated.

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The Eastern Malleable Iron Co., Naugatuck, has awarded the contract for the construction of a 1 story, 80 x 180 ft. foundry on South Ave., here. Estimated cost, $45,000. Noted Mar. 25.

Conn., Bridgeport—The Harvey Hubbell Co., Inc., Bostwick Ave., is preparing plans for the construction of a 4 story factory on State St., for the manufacture of electric specialties. Estimated cost, $175,000.

Conn., Bristol—A. Monico, 329 Park St., will build a 2 story, 65 x 120 ft. garage. Estimated cost, $60,000.

Mass., Whitinsville—The Whitins Machine Wks. is having plans prepared by J. D. Leland, Archt., 185 Devonshire St., Boston, for the construction of a 2 story, 60 x 240 ft. carpenter shop at its plant. Estimated cost, $80,000.

Mass., Worcester—S. La Gasse, 6 Crown St., has had plans prepared by E. T. Chapin, Archt., 310 Main St., for the construction of a 1 story, 67 x 120 ft. garage on Pleasant and Merrick Sts. Estimated cost, $30,000.

Mass., Worcester—The Norton Co., Barbers Crossing, is preparing plans for the construction of a 6 story, 42 x 176 ft. mill on New Bond St., for the manufacture of grinding wheels. Estimated cost, $100,000.

Mass., Worcester—The Whittaker Reed Co., 84 Austin St., has awarded the contract for the construction of a 1 story factory on Mayfield St., for the manufacture of loom reeds and belt hooks. Estimated cost, $25,000.

R. I., East Warren (Warren P. O.)—The Greyhound Motor Car Corp., 5 Columbus Circle, New York City, is preparing plans for the construction of a 1 story, 60 x 200 ft. factory. Estimated cost, $50,000.

R. I., Hillsgrove—The Rhode Island Malleable Iron Co. has awarded the contract for the construction of a 1 story, 56 x 90 ft. and 30 x 72 ft. addition to its foundry. Estimated cost, $35,000.

R. I., Pawtucket—F. Conlon, Summit St., is preparing plans for the construction of a 1 story, 60 x 117 ft. garage. Estimated cost, $30,000.

R. I., Providence—G. Scunzio, Douglas Ave. and Clym St., is preparing plans for the construction of a 1 story garage. Estimated cost, $30,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Coale Muffler and Safety Valve Co., 325 to 335 East Oliver St. will build a 33 x 42 ft. addition to its machine shop. Estimated cost, $3,500.

Md., Baltimore—The Natl. Steel Rolling Co., Keyser Bldg., plans to build a plant. Estimated cost, $100,000.

Md., Colgate Creek (Baltimore P. O.)—The Federal Government has purchased a tract of 30 acres adjoining Camp Holabird here, and will extend present machine shops and build several new ones. Extensive machinery and equipment will be installed.

Md., Cumberland—The Crystal Laundry Co., Baltimore St., is having plans prepared by J. W. Biddle, Archt., c/o Kelly Springfield Tire Co., River Rd., for the construction of a 1 and 2 story, 130 x 284 ft laundry, garage and power house. Estimated cost, $200,000.

N. J., Camden—The Packard Motor Co., 1129 Haddon St., will soon award the contract for the construction of a 1 story, 70 x 180 ft. garage and service building. Cost to exceed $10,000.

N. J., East Orange—G. E. Poth, Central St. and South Bway., has awarded the contract for the construction of a garage on Central and Shepard Sts. Estimated cost, 10,000.

N. J., East Orange—The Simms Magneto Co., 279 Halsey St., has awarded the contract for the construction of a 2 story, 154 x 167 ft. and 77 x 230 ft. factory on North Arlington Ave. Estimated cost, $385,000.

N. Y., Malone—The Hogle Motor Sales Co. plans to build a 2 story garage and machine shop on East Main St. Cost between $40,000 and $50,000.

N. Y., Newark—The H. A. Inman Co., 40 East Ave., plans to build a 1 story, 60 x 60 ft. foundry. Cost between $12,000 and $15,000.

N. Y., New York (Borough of Bronx)—S. B. Steinmetz, 930 Fox St., will build a 1 story, 100 x 140 ft. garage on Westchester Ave. Estimated cost, $30,000.

N. Y., Ogdensburg—The Ogdensburg Machine Co. plans to purchase property on Isabella St. and build 1 story, 44 x 112 ft. machine shop. Estimated cost, $25,000.

N. Y., Syracuse—The Acme Tool & Die Co., 314 East Water St., has purchased a 3 story building at 322 to 326 East Water St., and plans to equip same for its own use.

Pa., Erie—The Skinner Engine Co. is building an addition to its plant on Chestnut and 12th Sts. Estimated cost, $85,000.

Pa., Philadelphia—The Monarch Mfg. Wks., 3129 Emery St. (machinists), will soon award the contract for the construction of a 1 story, 32 x 52 ft. addition to its factory on Westmoreland and Richmond Sts.

SOUTHERN STATES

Ky., Louisville—P. Wells plans to build a 74 x 200 ft. garage on 3rd St. and Bway. Estimated cost, $100,000.

MIDDLE WEST

Ill., Chicago—The Vulcan Louisville Smelting Co., 208 LaSalle St., plans to rebuild a part of its plant which was recently destroyed by fire. Estimated cost, for complete renewal, $400,000.

Mich., Detroit—The Dept. of Pub. Wks. plans to build and equip 100.75 mi. of city electric railways, to include car shops and power houses. Estimated cost, $15,000,000.

Mich., Detroit—The Detroit Pressed Steel Co., 1800 Mt. Elliott Ave., will soon award the contract for the construction of a 1 story, 175 x 282 ft. factory on Mt. Elliott and Strong Aves., for the manufacture of auto parts.

Mich., Detroit—The Detroit Twist Drill Co., Fort St., will soon award the contract for the construction of a 100 x 112 ft. factory on Fort St. and 14th Ave. Estimated cost, $60,000.

Mich., Detroit—L. G. Grim, 395 Military Ave., plans to build a 1 story, 96 x 130 ft. garage on Linwood Ave. and Ferry Park. Estimated cost, $40,000. B. E. Mills, 1305 Kresge Bldg., Archt.

Mich., Detroit—The Hannan Real Estate Exch., 1 McGraw Bldg., is having plans prepared for the construction of a 3 story, 100 x 190 ft. garage on 2nd Ave. and Canfield St. Estimated cost, $175,000.

O., Cleveland—The Guarantee Bldg. Co., Union Bldg., has awarded the contract for the construction of a 4 story, 60 x 150 ft. garage and auto salesroom on East 55th St. and Prospect Ave. Estimated cost, $250,000.

O., Cleveland—The Loomis Sielaff Co., 6616 Morgan Ave. (machinist), has awarded the contract for the construction of a 1 story, 80 x 240 ft. factory at 6600 Morgan Ave. Estimated cost, $75,000. C. E. Terrill, Treas.

O., Cleveland—The Kelly Reamer Co., 1555 Columbus Rd., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory on West 73rd St. Estimated cost, $100,000.

O., Cleveland—The Natl. Acme Co., East 131st St. and Coit Rd., will soon award the contract for the construction of a 1 story addition to its factory for the manufacture of machinery. Estimated cost, $300,000. A. W. Henn, Pres. Noted April 1.

O., Dayton—The R. B. Karl Electric Automotive Co., 12 Broadwell Pl., is having plans prepared by F. Packard, Archt., New Hadyen Bldg., Columbus, for the construction of a 2 story, 75 x 120 ft. electric garage on West 2nd St. Estimated cost, $75,000.

O., Fremont—The Fremont Fdry. Co., has awarded the contract for the construction of a 1 story, 60 x 220 ft. foundry. Estimated cost, $100,000.

O., Piqua—The Piqua Motor Sales Co., Main St., has awarded the contract for the construction of a 2 story, 50 x 112 ft. garage and sales room. Estimated cost, $75,000.

O., Springfield—The Elwood Myers Co. has awarded the contract for the construction of a 3 story, 80 x 80 ft. factory on the west side, for the manufacture of motors. Estimated cost, $75,000.

O., Springfield—The Steel Products Eng. Co., East St., has awarded the contract for the construction of a 1 story, 60 x 152 ft. machine shop. Estimated cost, $50,000.

Wis., Milwaukee — The Milwaukee Rolling Mill Co. is building a 1 story, 380 x 425 ft. steel rolling mill. Estimated cost, $400,000.

Wis., Sheboygan—The Loeffler Machine Co. has awarded the contract for the construction of a 2 story, 177 x 295 ft. foundry and machine shop on 15th St. Estimated cost, $100,000.

Wis., West Allis—The Allis-Chalmers Mfg. Co. has awarded the contract for the construction of a 1 story, 130 x 500 ft. foundry. Estimated cost, $200,000.

WEST OF THE MISSISSIPPI

Colo., Colorado Springs—G. G. Birdsall, 31 Colorado Ave., has awarded the contract for the construction of a 1 story, 60 x 90 ft. garage and repair shop. Estimated cost, $25,000.

Minn., Minneapolis—The Robinson Motor Truck Co., 909 Hennepin Ave., is having plans prepared for the construction of a 2 story, 65 x 110 ft. garage and service station on 17th St. and Nicolet Ave. Estimated cost, $100,000.

Mo., Maplewood—The Bowen Motor Car Co., Title and Guarantee Bldg., St. Louis, has purchased 21 acres here, and plans to build plant for the manufacture of gasoline-driven, standard gage railway cars.

Mo., St. Louis—The Skinner Bros. Mfg. Co., 10th and Tyler Sts. manufacturer of industrial heaters and blow piping systems, is building a factory on Lunt and Vandeventer Aves. Estimated cost, $250,000.

Okla., Sapulpa—The Sapulpa Motor Co., Main and Hobson Sts., is having plans prepared by Monnat & Reid, Archts., 409 Empire Bldg., Oklahoma City, for the construction of a 2 story, 120 x 150 ft. garage. Estimated cost, $140,000.

Tex., Dallas—The Dallas Auto Laundry and Storage Co., c/o D. Spillers, Secy. and Mgr., Dallas Auto Club, is having plans prepared by C. W. Almstead, Engr., Cleveland, O., for the construction of a 6 story, 120 x 150 ft. garage. Estimated cost, $250,000.

Tex., Dallas—The General Motors Co. is having plans prepared by Lang & Witchell, Archts., Amer. Exch. Bank Bldg., for the construction of a 6 story, 100 x 100 ft. garage and salesroom on Jackson and Jefferson Sts. Estimated cost, $150,000.

WESTERN STATES

Cal., Sacramento—The Southern Pacific Ry. Co., 65 Market St., San Francisco, is preparing plans for the construction of a brass foundry, spring factory, sawmill and other structures. Estimated cost, $100,000.

CANADA

Ont., Prescott—The Coopers Brass Wks., Inc., Ogdensburg, N. Y., plans to purchase the distillery plant of J. P. Wiser & Sons Co., here and will alter, build additions and convert same into plant for the manufacture of brass. Cost between $30,000 and $40,000.

Ont., Toronto—The Canadian Genl. Electric Co., King and Simcoe Sts., will soon award the contract for the construction of a 4 story, 70 x 400 ft., and a 2 story, 52 x 175 ft. factory, on Wallace and Ward Aves., for the manufacture of electric supplies. Estimated cost, $300,000.

Ont., Welland—The Mead Morrison Co., 53 West Jackson Blk., Chicago, has purchased a large manufacturing plant here, and plans to alter and build additions to same for the manufacture of dredges, derricks, hoists, pumps, etc. W. S. Martin, Managing Dir.

General Manufacturing

NEW ENGLAND STATES

Conn., Broad Brook—The Broad Brook Co. has awarded the contract for the construction of a 5 story, 50 x 80 ft. factory, for the manufacture of wool. Estimated cost, $50,000.

Conn., Danielson—Powdrell & Alexander, 161 Devonshire St., Boston, are preparing plans for the construction of a factory for the manufacture of drapery fabrics.

Conn., Meriden—The Miller Brothers Cutlery Co., 464 Pratt St., has awarded the contract for the construction of a 4 story, 50 x 90 ft. factory. Estimated cost, $50,000. Noted March 18.

Conn., Middletown—The Standard Oil Co., 26 Broadway, New York City, is preparing plans for the construction of an oil plant, here. Estimated cost, $100,000.

Conn., New Haven—The Congress Candy Mfg. Co., 346 George St., will soon award the contract for the construction of a 1 story, 50 x 76 ft. factory. Estimated cost, $20,000. C. H. Abramovitz, 42 Church St., Archt.

Mass., Wakefield — The Heywood Bros. & Wakefield Co., Gardner, manufacturer of chairs, has awarded the contract for the construction of a 3 story factory, here. Estimated cost, $150,000. Noted Jan. 1.

Mass., Westfield—The Hampden Toy Co., Franklin St., has acquired a 4 story block on Elm St. and plans to equip same for its own use.

Mass., West Springfield (Springfield P. O.)—The F. M. West Box Co., 225 Liberty St., Springfield, and the New England Box Co., Greenfield, has purchased a 5½ acre site on Cold Springs Ave., west of the Boston and Albany R.R. and plans to build a large factory. Estimated cost, $50 000.

Mass., Worcester—The Osgood Bradley Car Co., West Boylston St., will build a 3 story addition to its plant for the manufacture of woolen goods. Estimated cost, $325,000.

R. I., Apponaugh—The Apponaugh Co. has awarded the contract for the construction of additions to its plant, to include a 4 story storehouse, a 2 story mercerizing building, and a 2 story dyehouse. Estimated cost, $500,000.

R. I., Woonsocket—The Nyanza Mills Co., 159 Singleton St., has awarded the contract for the construction of a 3 story, 155 x 300 ft. factory on Harding St., for the manufacture of textiles. Estimated cost, $300,000.

Vt., St. Johnsbury—The Cary Maple Sugar Co. has awarded the contract for the construction of a 2 and 4 story, 54 x 200 ft. factory. Estimated cost, $125,000. Noted Jan. 29.

MIDDLE ATLANTIC STATES

Md., Asbestos—A. Van Bibber, 6337 Drexel Rd., Philadelphia, has purchased the plant of the Baltimore Roofing and Asbestos Mfg. Co., here, and will repair and replace machinery for the manufacture of linoleum.

Md., Baltimore—The Presto-Lite Co., Inc., 30 East 42nd St., New York City, is preparing plans for the construction of eight 1 story acetylene plants, here, averaging 25 x 50 ft. Estimated cost, $75,000.

Md., Curtis Bay (Baltimore P. O.)—The Prudential Oil Co., Inc., 310 Keyser Bldg., Baltimore, will soon award the contract for the construction of a 1 story, 72 x 129 ft. refinery on 3rd and 4th Aves., here. Estimated cost, $25,000.

Md., Dukes (Adelina P. O.)—The West Virginia Pulp and Paper Co., 200 5th Ave., New York City, will build a 50 x 90 ft. and 100 x 120 ft. addition to its factory, here. Estimated cost, $300,000. Noted Apr. 1.

N. J., Irvington—The Kent Mfg. Co., 5 East 16th St., New York City, has awarded the contract for the construction of a cotton factory on Grace and Nye Sts., here. Estimated cost, $10,000.

N. J., Newark—The Essex Leather Bag Co., 11 Campbell St., has awarded the contract for the construction of a 3 story, 48 x 100 ft. factory on Clifton and Sherman Sts.

N. J., Newark—G. Fritz & Sons, 70 J St., manufacturers of candy, will soon award the contract for the construction of a 1 story, 60 x 100 ft. and 20 x 28 ft. addition to their factory. A. Peter, 828 Broad St., Archt.

N. J., Newark—The Hanovia Chemical and Mfg. Co. has awarded the contract for the construction of 3 story, 40 x 75 ft. factory on Chestnut St. and New Jersey R.R. Ave.

N. Y., New York (Borough of Brooklyn)—The Devoe Reynolds Co., 460 Smith St., will soon award the contract for the construction of a 4 story, 55 x 175 ft. factory on Hamilton and Smith Sts., for the manufacture of paint. F. A. Phelps, Union Bldg., Newark, N. J., Archt. Noted March 25.

N. Y., New York (Borough of Brooklyn)—The Keystone Varnish Co., 71 Otsego St. is having plans prepared by J. E. Ritchie, Archt. and Engr., 63 Park Row, New York city, for the construction of a 4 story, 50 x 100 ft. addition to its factory. Estimated cost, $85,000.

N. Y., New York (Borough of Brooklyn)—L. Walter, 132nd St. and Lincoln Ave., will build a 3 story, 50 x 90 ft. factory on 37th St., for the manufacture of cigar boxes. Estimated cost, $30,000.

N. Y., Norwich—The Abbott & Kohn Ribbon Co., 235 Ellison St., Patterson, N. J., plans to build a 1 story, 60 x 200 ft. factory, here. Cost between $40,000 and $50,000.

N. Y., Rochester—The Langslow Fowler Co., 216 Jay St., plans to build a 1 story, 45 x 122 ft. drying kiln on Smith St. Estimated cost, $35,000.

N. Y., Utica—The Kirk-Maher Co., 50 West Main St., Malone, has purchased a 2 story building on a 140 x 235 ft. lot on Lansing Ave. and 3rd St., here, and will install equipment for the manufacture of ice cream.

Pa., Easton—J. Schardley has awarded the contract for the construction of a bakery. Estimated cost, $100,000.

Pa., Philadelphia—The Belber Trunk and Bag Co., 1641 North Hancock St., has awarded the contract for the construction of a factory on Oxford and Masher Sts., for the manufacture of leather bags. Estimated cost, $20,000.

Pa., Philadelphia—J. Blood & Bro., Trenton and Allegheney Sts., have awarded the contract for the construction of a 2 story dyehouse on Janney and Clearfield Sts. Estimated cost, $60,000. Noted Feb. 19.

Pa., Philadelphia—The Dentist Supply Co., 5119 Stiles St., has awarded the contract for the construction of a 1 story, 60 x 62 ft. factory, at 5115 Stiles St. Estimated cost, $40,000.

SOUTHERN STATES

Fla., Jacksonville—Armour & Co., Tallyrand St., plans to double the size and capacity of its packing plant. G. H. Crane, Genl. Mgr.

N. C., Mooresville—The Mooresville Cotton Mills is having plans prepared by J. E. Sirrine, Archt., Greenville, S. C., for the construction of a 2 story, 75 x 160 ft. dyehouse. Estimated cost, $25,000.

N. C., Raleigh — The Pilot Cotton Mills has awarded the contract for the construction of a dyehouse. Estimated cost, $25,000.

Ky., Louisville—R. Mansfeld & Co., 625 East Market St., manufacturer of office and store fixtures, plans to build a 2 and 4 story, 140 x 246 ft. factory on Barret St. and Bway. Estimated cost, $100,000.

MIDDLE WEST

Ill., Chicago—Shea Smith & Co., 322 Federal St., manufacturer of stationery, plans to build a 5 story factory on Congress St. and Ashland Blvd. Estimated cost, $600,000.

Ill., Woodriver—The Standard Oil Co., Syndicate Trust Bldg., St. Louis, Mo., plans to build a plant, here, for the manufacture of lubricating oil.

Ind., Terre Haute—The Columbian Enameling and Stamping Co. has awarded the contract for the construction of a 1 story, 155 x 240 ft. factory. Estimated cost, $100,000.

Ind., West Terre Haute—The Valentine Packing Co. is preparing plans for the construction of a 1 and 2 story meat packing house. Estimated cost, $100,000. A. Valentine, Mgr.

Mich., Detroit—The Wolverine Auto Painting and Trimming Co., c/o Atwood & Trysell, Archts., 603 Temple Bldg., plans to build a 2 story, 90 x 100 ft. factory on Herbert and Martin Sts. Estimated cost, $25,000.

Mich., Grand Rapids—The Grand Rapids Tire and Rubber Co., 315-18 Kelsey Bldg., is preparing plans for the construction of a 2 and 3 story tire plant on Fuller Ave. along the tracks of the Grand Trunk Ry. Estimated cost, $400,000.

Mich., Manistee—The Manistee Canning Co. has awarded the contract for the construction of a 2 story, 86 x 250 ft. canning factory. Estimated cost, $100,000.

Mich., Muskegon—The Brunswick Balke Collender Co., Laketon Ave., has awarded the contract for the construction of a 4 story, 230 x 360 ft. factory for the manufacture of tires. Noted Feb. 13.

O., Cincinnati—The Presto-Lite Co., Inc., 30 East 42nd St., New York City, is preparing plans for the construction of several 1 story, 25 x 100 ft. acetylene plants, here. Estimated cost, $45,000.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave., is having plans prepared by W. R. McCormick, Archt., c/o Bd. Educ., for the construction of a 3 story high school on University Circle to include a manual training department. Estimated cost, $5,000,000.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave., will soon award the contract for the construction of a 3 story, 30 room school, on East 92nd St. and Parkgate Ave., to include a manual training department. Estimated cost, $600,000. Noted Mar. 18.

O., Marion—The Marion Packing Co. has awarded the contract for the construction of three additions to its plant, including a 4 story, 42 x 84 ft. pickle cellar.

Wis., Sheboygan—The Wisconsin Textile By-Products Co. is having plans prepared by W. C. Weeks, Archt., Ontario Ave., for the construction of a 2 story, 60 x 87 ft. factory. Estimated cost, $35,000.

Wis., Sheboygan Falls—C. S. Wiesse Co. is having preliminary plans prepared for the construction of a 4 and 6 story, 60 x 250 ft. tannery on Buffalo St. Cost between $100,000 and $150,000.

WEST OF THE MISSISSIPPI

Tex., McKinney—The Dunlite Co. is having plans prepared by E. R. Brackett, Engr., McKinney, for the construction of a 1 story auto lens factory. Estimated cost, $150,000.

Tex., Port Neches—The Magnolia Petroleum Co., 723 23rd St., Galveston, is having plans prepared by G. D. Anderson, Engr., 375 Keith Bldg., Beaumont, for the construction of the first unit of an oil refinery here, to have a daily capacity of 50,000 bbl. Estimated cost, $200,000.

WESTERN STATES

Cal., Wilmington—The Vegetable Oil Products Co., Wilmington, Del., has requested a lease on city lands on the inner harbor, on which it plans to build a refinery. First unit to cost $300,000.

Wash., Seattle—The Seattle Baking Co., 302 19th St., S., is having plans prepared by A. C. P. Willatzen, Archt., Bolton Pl., for the construction of a 2 story, 104 x 117 ft. bakery on 19th and Main Sts. Estimated cost, $110 000.

CANADA

Ont., Guelph—The Ontario Agricultural College is having plans prepared by F. R. Heakes, Archt., Parliament Bldg., Toronto, for the construction of a 1 story dairy building. Estimated cost, $150,000.

Ont., Hamilton—T. B. McQuestion, Chn. of the Civic Gas Com., recommended that the city build a gas manufacturing plant. Estimated cost, $3 000,000. E. R. Gray, City Hall, Engr.

Ont., Kitchener — The Lang Tanning Co., Frances St., is receiving bids for the construction of a 3 story tannery. Estimated cost, $150,000.

Ont., Oakville—The Oakville Basket and Veneer Wks. will rebuild its 2 story box factory on Dundas St., which was recently destroyed by fire. Estimated cost, $80,000.

Ont., Timmins—The Ontario Tie Timber and Constr. Co. plans to build a sawmill along the banks of the Mattagami River. Estimated cost, $50,000.

Ont., Toronto—The Canada Bread Co., 160 Avenue Rd., is having plans prepared by C. J. Gibson, Archt., Excelsior Life Bldg., for the construction of a 2 and 3 story bakery. Estimated cost, $200,000.

Ont., Toronto—Langleys Limited, 289 Sumach St., plans to build a 4 story cleaning, dyeing and pressing works on Gerrard St. and Carlau Ave. Estimated cost, $100,000.

Que., Chelsea—The Royal Securities Corp., Ltd., 164th and James Sts., Montreal, plans to build a pulp and paper mill on Gatineau Rd., here. Estimated cost, $1,000,000.

Que., Montreal—The Barrett Mfg. Co., 2004 St. Hubert St., is having plans prepared for an addition to its plant, for the manufacture of tar products. Estimated cost, $32,000.

Que., Montreal—J. S. Fry & Co., 27 Sacrament St., manufacturer of chocolate, is having plans prepared for the construction of a plant. Estimated cost, $250,000.

Sask., Moose Jaw—The Western Oil Co., Ltd., will soon award the contract for the construction of a large oil refinery.

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